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Building Population Demographics and Energy Consumption for Health Care Facilities in Canada

Building Population Demographics and Energy Consumption for Health Care Facilities in Canada

A RESEARCH REPORT

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ABSTRACT

Results of a survey, conducted by the Task Force on Energy Management in Canadian Health Care Facilities in cooperation with the Canadian Hospital Association, indicate that energy usage in Canadian hospitals, for the fiscal year ending 31 March 1981, averaged 2.81 G.J./M^2 (72.6 kWH/ft^2) and 256 G.J./Bed (71,100 kWH/Bed). It was also found that the energy usage varied significantly with hospital size.

Energy consumption in all Canadian hospitals, for the fiscal year ending 31 March 1981, has been estimated to be 48.7 x 10^6 G.J. (13.5 x 10^9 kWH) $\pm$ 10%. Energy consumption in special care facilities, for the same period has been estimated at 24.9 x 10^6 G.J. (6.9 x 10^9 kWH) $\pm$ 30%. Energy consumption in facilities for the provision of out-of-hospital insured services has not been considered in the present study. Thus, the total annual energy consumption in the health care facilities sector, as of 31 March 1981, has been estimated to be at least 73.6 x 10^6 G.J. (20.4 x 10^9 kWH) $\pm$ 17%.

Preliminary estimates suggest that the potential for conservation in hospitals ranges from 3.3 x 10^6 to 15.1 x 10^6 G.J. (2.3 x 10^9 to 4.2 x 10^9 kWH) per year, and the potential for conservation in special care facilities ranges from 2.0 x 10^6 to 3.7 x 10^6 G.J. (0.6 x 10^9 to 1.0 x 10^9 kWH) per year. For the total sector, the conservation potential ranges from 10.3 x 10^6 to 18.8 x 10^6 G.J. (2.9 x 10^9 to 5.2 x 10^9 kWH) per year. With energy costs ranging between $5 and $10 per G.J., the conservation potential, in terms of dollars, is between $51.5 million and $188 million annually.

RESUME

Il ressort d'un sondage mené par le Groupe de travail sur la gestion de l'énergie dans les établissements de santé canadiens, en collaboration avec la *Canadian Hospital Association*, que la consommation d'énergie dans les hôpitaux canadiens au cours de l'exercice financier qui s'est terminé le 31 mars 1981 était en moyenne 2,81 GJ/m^2 (soit 72,6 kWh/pi^2) et 256 GJ/lit (soit 71 100 kWh/lit). Il semble également que la consommation d'énergie relevée variait considérablement en fonction de l'importance de l'hôpital.

La consommation d'énergie de tous les hôpitaux canadiens pour la même période est estimée à 48,7 x 10^6 GJ (soit 13,5 x 10^9 kWh), $\pm$ 10 p. 100. Celle des établissements de soins spécialisés est estimée 24,9 x 10^6 GJ (soit 6,9 x 10^9 kWh), $\pm$ 30 p. 100. Toutefois, celle des établissements dispensant des services externes assurés n'a pas été évaluée dans le cadre de la présente étude. En conséquence, la consommation globale annuelle d'énergie du secteur des soins de santé a été estimée, au 31 mars 1981, au moins 73,6 x 10^6 GJ (soit 20,4 x 10^9 kWh), $\pm$ 17 p. 100.

Une première estimation révèle qu'il serait possible de diminuer la consommation d'énergie de 8,3 x 10^6 GJ à 15,1 x 10^6 GJ (soit de 2,3 x 10^9 kWh à 4,2 x 10^9 kWh) par année dans les hôpitaux et de 2,0 x 10^6 GJ à 3,7 x 10^6 GJ (soit 0,6 x 10^9 kWh à 1,0 x 10^9 kWh) par année dans les établissements de soins spécialisés. Globalement, les possibilités d'économie se chiffrent entre 10,3 x 10^6 GJ et 18,8 x 10^6 GJ (soit 2,9 x 10^9 kWh et 5,2 x 10^9 kWh) par année pour le secteur, ce qui signifierait une diminution de 51,1 millions de dolalrs à 188 millions de dollars par année des frais d'énergie dans ce secteur, étant donné que le coût de l'énergie varie entre 5 $ et 10 $ du gigajoule.

Le lecteur trouvera un sommaire en français de ce rapport à la page ii.

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The objective of this study is to develop a foundation for a comprehensive data base of building energy use and conservation potential in the hospital sector. In the context of this study, the sector includes hospitals, special care facilities, and facilities for the provision of out-of-hospital insured services, as per definitions by Statistics Canada.

This report is prepared primarily for internal BETT Program review. This development of building population demographics and energy consumption figures may provide for expansion of the BETT program to include the Hospital Sector. Energy consumption in the Hospital Sector is significant, as is that of each of the BETT Program Sectors (Restaurant, Retail, Warehousing and Light Industrial, Office, Medium to High-Rise Residential and Low-Rise Residential).

Dessau Consultants Inc. would like to acknowledge with special thanks S. Zaborowski, A. Holmes, I. Fraser, E.J. Parker, G.B. Seely, H. Callan and W.J. Drodge for their assistance and constructive suggestions.

The numerical tabulations and calculations in this report have been presented in S.I. units. The following conversion factors may be used to obtain values in imperial units.

$$ft^2 = m^2 \times 10.75$$

$$kWH = G.J. \times \frac{1\ 000}{3.6}$$

$$\frac{kWH}{ft^2} = \frac{G.J.}{m^2} \times 25.83$$

Le secteur des soins de la santé comprend

- les hôpitaux,
- les établissements de soins spécialisés et
- les établissements qui dispensent des services externes assurés.

Les données obtenues de Statistique Candaa ont permis de déterminer le nombre d'installations appartenant à chaque groupe : au 31 mars 1981, il y avait au Canada 1 288 hôpitaux, 5 143 établissements de soins spécialisés et 575 établissements dispensant des services externes assurés. On connaît également le nombre de lits des hôpitaux et des établissements de soins spécialisés. Il y avait en effet au 31 mars 1981 186 160 lits dans les hôpitaux et 222 305 lits dans les établissements de soins spécialisés. Il n'existe toutefois aucune source centralisée de données en ce qui concerne la superficie et la consommation d'énergie des établissements canadiens du secteur de la santé.

Nous avons établi que 41,3 p. 100 des hôpitaux et 60,7 p. 100 des lits d'hôpital du Canada se trouvent au Québec et en Ontario. On trouve aussi dans ces deux provinces 52,4 p. 100 des établissements de soins spécialisés et 59,3 p. 100 des lits attribués à ces établissements au Canada. Enfin, nous avons également constaté que 62,4 p. 100 des établissements dispensant des services externes assurés se trouvent en Ontario et que l'Ontario et le Québec comptent 71,1 p. 100 des établissements de ce genre au Canada.

Il ressort également que 15,3 p. 100 des hôpitaux ont 300 lits ou plus, et regroupent de ce fait, 59,3 p. 100 des lits hospitaliers du Canada. De même, 11 p. 100 des établissements de soins spécialisés comptent 100 lits ou plus, ce qui représente 48,2 p. 100 du nombre de lits dans ce secteur.

Par ailleurs, 84,7 p. 100 des hôpitaux, soit 96,0 p. 100 des lits hospitaliers, sont de propriét publique. Les autres sont des établissements privés ou fédéraux. En revanche, seulement 20,2 p. 100 des établissements de soins spécialisés, soit 39 p. 100 des lits de ce secteur, sont de propriété publique. Le reste de ces établissements (et lits) appartiennent à des particuliers ou à des communautés religieuses ou laïques.

Enfin, de façon générale, les hôpitaux et les établissements de soins spécialisés les plus importants (du point de vue du nombre de lits)

sont de propriété publique, tandis que les établissements moins importants appartiennent à des particuliers ou à des communautés religieuses ou laïques.

Nous avons estimé la consommation d'énergie des hôpitaux canadiens en nous fondant sur le nombre de lits qui s'y trouvent et sur les résultats d'un sondage mené auprès de 541 hôpitaux par le Groupe de travail sur la gestion de l'énergie dans les établissements de santé canadiens. Il ressort du sondage qu'il y a un lien étroit entre la consommation d'énergie par superficie unitaire (GJ/m^2) et la consommation d'énergie par lit (GJ/lit). Par conséquent, comme il n'existe pas de statistiques en ce qui concerne la superficie de ces établissements, nous avons évalué la consommation globale d'énergie des hôpitaux, de façon générale, en multipliant la consommation d'énergie par lit par le nombre de lits. Il semblerait d'après ces calculs que la consommation d'énergie des hôpitaux canadiens entre le 1er avril 1980 et le 31 mars 1981 ait été $48,7 \times 10^6$ GJ, $\pm$ 10 p. 100.

La consomation d'énergie des hôpitaux du Québec et de l'Ontario représente 63,6 p. 100 de la consommation estimative de tous les hôpitaux canadiens et celle des hôpitaux comptant 300 lits ou plus représente 62,4 p. 100 de la consomation estimative totale.

Notre estimation de la consommation d'énergie des établissements de soins spécialisés est beaucoup moins précise : elle se chiffre à $24,9 \times 10^6$ GJ, la marge de jeu pouvant être de 30 p. 100, ce qui est assez considérable.

La consommation annuelle d'énergie des établissements canadiens de soins de santé (à l'exclusion de ceux qui dispensent des services externes assurés) est estimée $73,6 \times 10^6$ GJ, $\pm$ 17 p. 100. Pour remettre cette estimation en contexte, disons que la consommation d'énergie de tous les ministères et organismes fédéraux (exception faite des principaux usagers commerciaux et industriels comme le Canadien National, Air Canada et l'Énergie atomique du Canada Limitée) se chiffrait à $78,2 \times 10^6$ GJ au cours de l'exercice financier qui s'est terminé le 31 mars 1981 "18".

Il semble d'après une toute première estimation des possibilités d'économie d'énergie dans les hôpitaux canadiens qu'on pourrait viser une consommation de 1,94 GJ/m^2 à 2,32 GJ/m^2 (ou de 50 kWh/pi^2 à 60 kWh/pi^2). Les possibilités d'économie se chiffreraient alors entre 8,3 x 10^6 GJ et 15,1 x 10^6 GJ par année. D'après une estimation encore plus grossière, les possibilités d'économie d'énergie des établissements de soins spécialisés se chiffreraient entre 2,6 x 10^6 GJ et 3,7 x 10^6 GJ par année. Ainsi, les possibilités globales d'économie d'énergie dans le secteur des soins de la santé sont estimées entre 10,3 x 10^6 GJ et 18,8 x 10^6 GJ par année. Le coût de l'énergie se chiffrant entre 5 $ et 10 $ du gigajoule, on pourrait économiser de 51,5 millions de dollars à 188 millions de dollars par année.

The Buildings Energy Technology Transfer Program (BETT) under the direction of Energy, Mines and Resources Canada, has as its objective to research, gather, develop, and disseminate information in building technology, so as to facilitate energy conservation efforts in buildings on a Canada-wide basis, and ultimately, so as to support the national goal of energy self-sufficiency.

Seven specific building sectors have already been addressed by the BETT. These are:

i) Offices
ii) Medium to High-Rise Residential
iii) Low-Rise Residential
iv) Retail Stores
v) Restaurants
vi) Warehouses
vii) Light Industrial Buidings

This report addresses an eighth sector, namely Health Care Facilities.

The objective of the work reported herein is to develop a foundation for a comprehensive data base of building energy use and conservation potential in the Health Care Sector. Accomplishing this objective involves the following three tasks:

a) Access and review information relevant to a description of a comprehensive R,D and D energy conservation project to be undertaken in the Health Care Facility sector. This includes information that may lead to:

- The definition of Health Care Facilities as a building sector.
- An estimate of the building population in Canada.
- A description of energy use areas within a typical Health Care Facility.
- The conservation potential in the sector as a whole for Canada.
- Identification of the intended target audience(s) for the dissemination of information developed through an R,D and D Health Care Facility energy conservation project.

b) Examine and recommend a methodology for the extraction and development of the foundation data required as a base for the definition of R,D and D task areas according to priority of importance.

For the purposes of this study, emphasis has been placed on task (a) above. Also, due to limitations of time and resources, this study has concentrated on "Hospitals", which represent a large proportion of Health Care Facilities. Other Health Care Facilities have also been treated, but in less detail.

2.1 Required Data A significant amount of work has already been undertaken to determine (in general terms) the kind of data required for a comprehensive data base of building energy use and conservation potential «1, 2, 3» *. From this has emerged the realization that the development of a data base requires a careful balance between the following factors:

a) The content, as defined by the end users or uses. e.g. - A data base whose primary use is demand forecasting for electrical utilities will require somewhat different information than a data base used primarily for identifying conservation potential by government agencies.

b) The sources of the data (e.g. Statistics Canada), insofar as completeness, level of disaggregation, ease of retrieval, cost, confidentiality, etc, are concerned.

In performing this balancing act, other factors come into play, namely the resources of budgets, time, and manpower.

For the purposes of developing a data base for the Health Care Facility Sector, an initial "Shopping List" of required information includes:

i) Sector definition
ii) Number of buildings
iii) Size of buildings (e.g. heated floor area)
iv) Location - Province or climatic zone
v) Age of building, and remaining useful life
vi) Number of beds and patient-days
vii) Environmental standards, including space per bed, lighting, temperature, fresh air, and humidity levels
viii) Total yearly energy consumption
ix) Breakdown of total yearly energy consumption by fuel types and by end-uses
x) Type of HVAC System

* Numbers contained in brackets « » refer to references listed at the end of the text of this report.

2.2 Sources of Data The following sources of data pertaining to the Health Care Facility Sector have been identified:

a) Statistics Canada
b) Canadian Hospital Association
c) Provincial Ministries or Departments of Health
d) Task Force on Energy Management in Health Care Facilities in Canada
e) Energy, Mines and Resources Canada
f) Published Literature

An assessment of the information "available" from these sources is presented in the next section of this report.

2.3 Content of Existing Data

a) Statistics Canada is the single most complete source of information on population demographics in the Health Care Facility Sector. Statistics Canada publishes three annual reports «4, 5, 6» which cover 1,288 Hospitals, 5,143 Special Care Facilities, and 575 Facilities for the provision of out-of-Hospital insured services:

i) Catalogue 83-201 - "List of Canadian Hospitals and Special Care Facilities". This publication lists the name, province and municipality, type of ownership, and number of approved beds for Canadian Hospitals and Special Care Facilities. Also included is a listing of facilities for the provision of out-of-hospital insured services. Summary tabulations are provided. This publication is prepared on the basis of annual information received from the various Provincial Ministries/ Departments of Health.

ii) Catalogue 83-232 - "Hospital Annual Statistics" This publication is prepared on the basis of information contained in the annual return of hospitals (excluding psychiatric hospitals). There are numerous tables detailing the number of hospitals, number of beds, type of services, patient-days, rate of occupancy, income and operating costs, etc.

iii) Catalogue 83-205 - "Mental Health Statistics, Vol III, Institutional Facilities, Services, and Finances". This publication is prepared on the basis of information contained in the annual return of hospitals. Data refers to separate psychiatric hospitals, as well as to psychiatric wards of general hospitals. Numerous tables detail the number of institutions, number of beds, type of services and ownership, patient-days, rate of occupancy, operating revenues and costs, etc.

All of the above documents contain a glossary of definition of terms. Statistics Canada data does not include the size (i.e. heated area) or age of buildings, information on environmental conditions and types of HVAC systems, or data on energy consumption. However, the annual return does contain the following information of energy costs in public hospitals «7» which is available from Statistics Canada on special request:

- Purchased steam or heat
- Fuel
- Electricity, with indication if for lighting only, or lighting and heating.

Energy costs in the Special Care and other Facilities have not been collected.

b) The Canadian Hospital Association (CHA) publishes the following two annual reports «8, 9»

i) "Canadian Hospital Directory". This publication lists the name, address, type of facility and type of ownership, and number of beds for 1,373 Canadian hospitals. Summary tabulations are provided.

ii) "Directory of Long-Term Care Centres in Canada". This publication lists the name, address, type of facility and type of ownership, and number of beds for 2,861 Canadian Long-Term Care Centres. Summary tabulations are also provided.

Both of the above publications contain a glossary of definition of terms. They do not include the size or age of buildings, information on environmental conditions and HVAC systems, or data on energy consumption or costs.

c) Provincial Ministries or Departments of Health.
Three Ministries or Departments were contacted:

i) The Ontario Ministry of Health
ii) The Ontario Ministry of Community and Social Services
iii) The New Brunswick Department of Health.

The Ontario Ministry of Health (OMH) is the provincial jurisdiction for all public hospitals, except psychiatric and federal, in Ontario. It collects annual energy consumption data on most, but not yet all, non-psychiatric hospitals in Ontario. Details of the information on hand at the OMH «8» are given in Appendix F.

The Ontario Ministry of Community and Social Services (COMSOC) is the provincial jurisdiction for psychiatric hospitals, and for "homes for the aged" (public) and "nursing homes" (proprietary). It does not cover "rest homes" (proprietary). COMSOC collects annual energy consumption data on approximately 500 buildings which are operated by this Ministry. While it is possible that this information could be made available, special permission for its release must be obtained from Queen's Park. This was not accomplished in time for inclusion in this study.

The New Brunswick Department of Health (NBDOH) collects annual energy consumption data for all New Brunswick hospitals. Details of the information on hand at the NBDOH «9» are given in Appendix G.

In general, while much valuable information probably exists, Canada-wide, with the provincial jurisdictions, accessing this information is difficult for the following reasons:

i) The provincial jurisdictions represent a complex infrastructure, with different structures from one province to the next. A significant effort is required to learn who is responsible for what.

ii) Sometimes special arrangements (permission) must be made for the use of, or access to, the information on hand.

iii) Data on hand is sometimes computerized, and sometimes tabulated manually. In the cases of both Ontario and New Brunswick, data existed on an individual Hospital basis, and needed to be further minipulated (or aggregated) into the desired formats.

iv) Available data is sometimes incomplete (e.g. - not all hospitals are included).

d) The Task Force on Energy Management in Health Care Facilities in Canada (The "Task Force") conducted a Canada-wide survey «10» on energy use in 541 hospitals for the period 1 April 1980 to 31 March 1981. This survey was done in cooperation with the Canadian Hospital Association. Details of the survey are included in Appendix D.

e) Energy, Mines and Resources Canada, in support of its Propane Distribution System Expansion Program, recently undertook a survey of energy use in 375 Special Care Facilities located in non-gas-pipeline areas «11». This survey was done on sub-contract to EMR by MacLaren Plansearch Inc. For each facility, the following information was collected:

i) Province and Census Division
ii) Quantity of liquid fuel oil consumed (m^3)
iii) Quantity of diesel fuel consumed (m^3)
iv) Quantity of propane consumed (m^3)
v) Electricity consumption in MWH's or electricity cost in dollars
vi) The dates applicable to the reported consumption.

This data, while applicable mostly to non-urban areas, is nevertheless a useful input for estimating energy consumption in Special Care Facilities. Unfortunately, this information was received too late (16 March'83) and in too raw a form to permit its utilization in the present study.

f) The Published Literature on energy consumption in Health Care Facilities (e.g. case studies, surveys, etc) is too numerous to itemize here. Individual reference to applicable material has been made throughout the remainder of this text, where appropriate.

2.4 Selection of Data Sources for the Purposes of this Study Upon consideration of the factors which must be balanced in developing a data base, as discussed earlier in Section 2.1, the following sources of data were chosen for this study:

a) Statistics Canada, for population demographics on Hospitals, Special Care Facilities, and Facilities for the provision of out-of-hospital insured services.

b) "Task Force" survey, for estimating energy consumption and conservation potential in Hospitals.

c) Data from OMH and NBDOH for spot check verification of estimated consumption and conservation potential in Hospitals.

d) Miscellaneous sources for "guestimating" the energy consumption and conservation potential in Special Care Facilities, and for describing energy use areas within a typical facility.

Having identified and evaluated the sources of existing data, the Health Care Facility Sector can now be defined.

For the purposes of this report, the Health Care Facility Sector includes:

a) Hospitals

b) Special Care Facilities

c) Facilities for the provision of out-of-hospital insured services.

The following are excluded:

- Doctor's offices, unless included with a facility identified in a, b, c above.
- Day-care centres (i.e. for pre-school children)
- Physical fitness centres
- Health spa's
- Crisis referral centres
- Other non-residential, health-related facilities.

To further clarify the sector, the following definitions adopted by Statistics Canada «4» are presented.

3.1 Hospitals A hospital is defined as a health care institution where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services, and which is licensed or approved as a hospital by a provincial government, or is operated by the Government of Canada. This definition includes mental institutions.

There are three hospital categories, namely:

- Public (including voluntary, provincial, and municipal). This applies to a hospital recognized by the province as a "public hospital". Such a hospital is generally not operated for profit.

- Proprietary This applies to a hospital owned by an individual or by a private organization, operated for a profit, and recognized by the provinces as a "proprietary hospital".

- Federal This applies to a hospital owned by a department or agency of the Government of Canada (e.g. DVA) and operated on a non-profit basis.

Hospitals are further classified according to the predominant type of treatment and care provided by the institution, namely:

- General A general hospital provides primarily for the diagnosis and short-term treatment of patients for a wide range of diseases and injuries, and is not restricted to a specific age-group or sex.

- Allied Special hospitals include pediatric, rehabilitation (including convalescent), extended care (including chronic), and miscellaneous (e.g. cancer, cardiology, neurology, outpost hospitals, and nursing stations).

- Psychiatric hospitals include hospitals for alcoholics and/or drug addicts, and mental hospitals.

3.2 Special Care Facilities A special care facility is (here) defined as a residential facility which maintains four or more beds for residents other than members of staff and which provides care to at least one resident. These facilities are, in general, maintained for people, chronically ill or disabled who reside there more or less permanently, in contrast to, for example, a hospital where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services.

Special care facilities are classified into 10 categories, according to the principal characteristics of the predominant group which comprises the largest number of residents in the facility. These 10 categories are:

- Aged
- Physical Handicap
- Retarded
- Mental Handicap
- Emotionally Disturbed Children
- Alcohol/Drug
- Delinquent
- Unmarried Mother
- Transient
- Other

Special care facilities are further classified according to the ownership (i.e. responsibility for financial status) of the facility, namely:

- Religious/lay Religious group/ non-profit voluntary associations, societies, or fraternities.

- Public This includes municipal (city, town, province) and provincial (a branch, division, or department of a provincial or territorial government, or a provincially-controlled institution such as a university).

- Proprietary Applies to private individual, partnership, or corporation regardless of financial aid received by owner or residents, and operated for a profit.

- Federal This includes a department, crown corporation, or other agency of the Government of Canada.

3.3 Facilities for the provision of out-of-hospital insured services These are facilities where patients are provided with diagnostic and therapeutic services and which are licensed or approved by a provincial government. Such facilities do not normally provide inpatient accommodation (e.g. no beds).

Such facilities include:

- Diagnostic Laboratories
- Radiology Services
- Health Centres
- Red Cross Blood Depots
- Specialty Clinics

For the purposes of this study, the population of Health Care Facilities in Canada is that which existed as at 31 March 1981. The following points are given in support of this approach:

a) The survey of energy use in hospitals conducted by the "Task Force" covered the period 1 April 1980 to 31 March 1981.

b) A quick comparison of the number of Health Care Facilities and number of beds in Canada between 1977 and 1982 indicates that the population has remained essentially constant during those 5 years.

Secondly, the population data discussed here and throughout the remainder of this report are those presented in Statistics Canada Catalogue # 83-201, 1981 «4». The distribution of these facilities and beds, by size category, was provided by Statistics Canada, on special request, in a custom report «12».

A final general point worth noting here is that a "hospital" or "special care facility" can be one building, or two or more buildings which are either separated or connected.

4.1 Hospital Population Demographics (Ref. Appendix B)
Table 4.1 presents the distribution of hospitals and hospital beds in Canada, by type of service and by category (e.g. public, proprietary, federal). There are 1,288 hospitals, and 186,160 hospital beds in Canada. Public hospitals represent 84.7% of the total number of hospitals, and 96.0% of the total number of hospital beds. The average sizes (beds per hospital) of the three hospital categories are as follows.

CATEGORY	AVERAGE SIZE (BEDS/HOSPITAL)
Public	164
Proprietary	60
Federal	27

TABLE 4.1

DISTRIBUTION OF HOSPITALS AND HOSPITAL BEDS IN CANADA, BY TYPE OF SERVICE AND BY CATEGORY

31 MARCH 1981

TYPE OF SERVICE		CATEGORY							
		PUBLIC		PROPRIETARY		FEDERAL		TOTAL	
		Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds
GENERAL	Sub-Total	861	127,348	6	300	16	1,531	883	129,179
ALLIED SPECIAL	Pediatric	8	2,919	-	-	-	-	8	2,919
	Rehab. & Extend. Care (1)	149	32,595	50	2,997	1	1,130	200	36,722
	Other (2)	36	2,757	4	120	114	667	154	3,544
	Sub-Total	193	38,271	54	3,117	115	1,797	362	43,185
PSYCHIATRIC DISORDERS	Alcoholic	3	193	-	-	-	-	3	193
	Mental	26	11,916	-	-	-	-	26	11,916
	Psychiatric	8	1,007	3	342	3	338	43	1,687
	Other (3)	-	-	-	-	-	-	-	-
	Sub-Total	37	13,116	3	342	3	338	43	13,796
	TOTAL	1,091	178,735	63	3,759	134	3,666	1,288	186,160

NOTES: (1) Includes Convalescent and Chronic
(2) Includes Maternity, Orthopedic, Neurological, Cancer, Outpost Hospitals, etc.
(3) Includes Emotionally Disturbed Children, Epileptic, and Mental other.

Table 4.2 tabulates the distribution of hospitals and hospital beds in Canada, by size category. This distribution is shown graphically in Figure 4.1. It is noted here that while those hospitals with 300 or more beds constitute only 15.3% of the total number of hospitals, they represent 59.3% of the total number of beds.

The distribution of hospitals and hospital beds by province is tabulated in Table 4.3, and illustrated in Figure 4.2. We see here that the two largest provinces, Ontario and Quebec account for 41.3% of the hospitals, and 60.7% of the hospital beds in Canada. The four Western provinces account for 42.9% and 29.9% of the hospitals and beds respectively, while the Maritime provinces and Territories account for the remaining 15.8% of hospitals and 9.3% of hospital beds. This leads to the general observation that the large hospitals tend to be located in Ontario and Quebec where the average hospital size is 213 beds. For the Western provinces, the average size is 101 beds, and for the Maritime provinces and Territories, the average size is 85 beds.

TABLE 4.2

DISTRIBUTION OF HOSPITALS AND HOSPITAL BEDS IN CANADA BY SIZE CATEGORY

31 MARCH 1981

SIZE CATEG.	FACILITIES NO.	% OF TOT.	BEDS NO.	% OF TOT.
1-24	368	28.6	4,416	2.4
25-49	229	17.8	8,008	4.3
50-99	207	16.1	14,139	7.6
100-199	182	14.1	24,223	13.0
200-299	104	8.1	25,021	13.4
300-499	110	8.5	42,592	22.9
500-799	61	4.7	37,237	20.0
800-1999	25	1.9	25,505	13.7
2000 +	2	0.2	5,019	2.7
TOTAL	1,288	100	186,160	100

NOTE: The above information has been summarized from Tables B.2 through B.5.

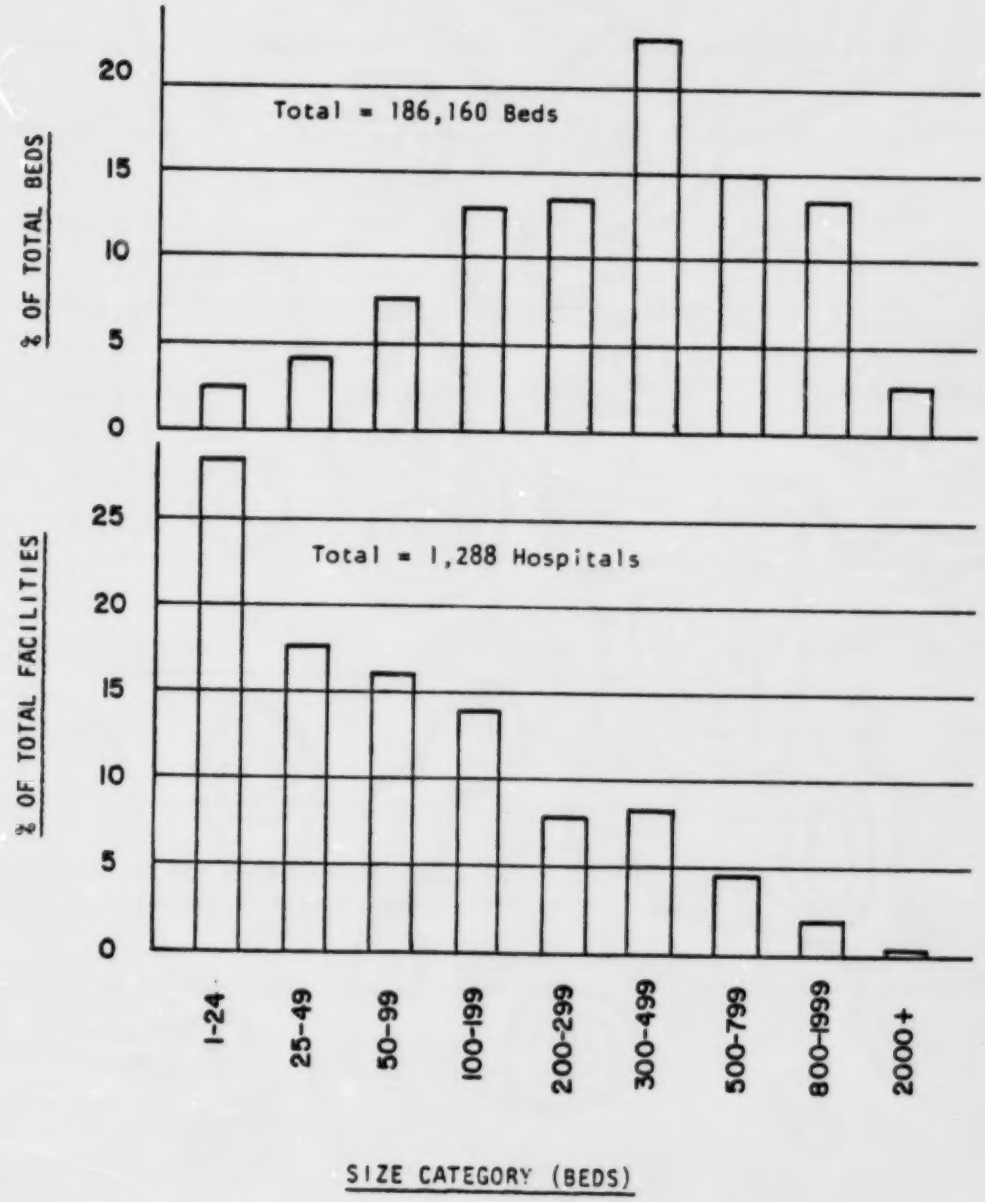


FIGURE 4.1 Percentage distribution of hospitals and hospital beds in Canada, by size category.

TABLE 4.3

DISTRIBUTION OF HOSPITALS AND HOSPITAL BEDS IN CANADA, BY PROVINCE

31 MARCH 1981

PROVINCE OR TERRITORY	FACILITIES		BEDS	
	NO.	% OF TOT.	NO.	% OF TOT.
NFLD	48	3.7	3,835	2.1
PEI	12	0.9	986	0.5
NS	55	4.3	6,499	3.5
NB	36	2.8	5,385	2.9
QUE	248	19.3	53,507	28.7
ONT	284	22.0	59,611	32.0
MAN	107	8.3	8,087	4.3
SASK	145	11.3	8,466	4.5
ALTA	160	12.4	17,239	9.3
BC	141	10.9	21,981	11.8
YUKON	6	0.5	161	0.1
NWT	46	3.6	403	0.2
TOTAL	1,288	100	186,160	100

NOTE: The above information has been summarized from Tables B.2 through B.5.

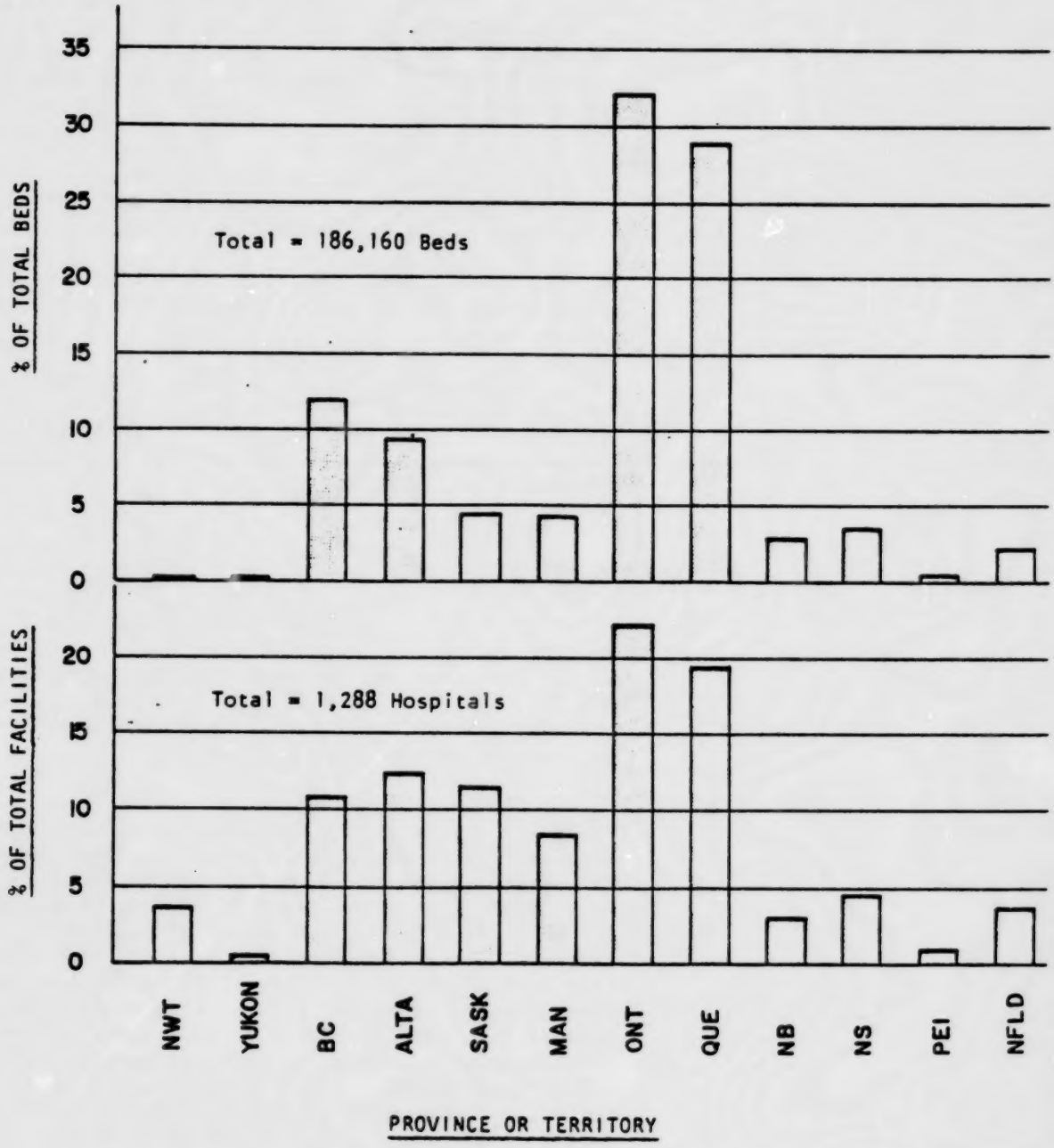


FIGURE 4.2 Percentage distribution of hospitals and hospital beds in Canada, by province.

4.2 Special Care Facility Population Demographics (Ref. Appendix C). Table 4.4 presents the distribution of special care facilities and beds in Canada, by principal characteristics of the predominant group of residents, and by type of ownership. There is a total of 5,143 special care facilities in Canada, representing 222,245 beds. The following points are noteworthy:

a) Facilities for aged persons represent the single largest type of facility, accounting for 43% of the facilities and 63% of the beds.

b) The summary data tabulated below describes the distribution of special care facilities by type of ownership.

TYPE OF OWNERSHIP	% OF FACILITIES	% OF BEDS	AVERAGE SIZE (BEDS/FACILITY)
Public	20.2	39.0	83
Proprietary	49.0	35.7	32
Relig/Lay	30.8	25.2	35
Federal	0.0	0.1	110

We see that with the exception of the two federally-owned facilities, the public facilities are, on-the-average, substantially larger than either the proprietary or religious and lay.

Table 4.5 tabulates the distribution of special care facilities and beds in Canada, by size category. This distribution is shown graphically in Figure 4.3. Those facilities which have 100 or more beds account for only 11% of the total number of facilities, but represent 48.2% of the total number of beds. More than half of the facilities (57.1%) each have less than 25 beds. Clearly, a very large proportion of special care facilities are of a very small size. Discussion with several people knowledgeable in the field revealed that many of these small special care facilities (e.g. 4-10 beds) are probably former single-family residential buildings which have been converted.

TABLE 4.4

DISTRIBUTION OF SPECIAL CARE FACILITIES AND BEDS IN CANADA, BY PRINCIPAL CHARACTERISTICS OF PREDOMINANT GROUP OF RESIDENTS, AND BY TYPE OF OWNERSHIP

31 MARCH 1981

PRINCIPAL CHARACTERISTICS OF PREDOMINANT GROUP OF RESIDENTS	TYPE OF OWNERSHIP									
	PUBLIC		PROPRIETARY		RELIG./LAY		FEDERAL		TOTAL	
	Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds
Aged Persons	645	56,045	1,184	52,484	378	31,511	2	219	2,209	140,259
Mental Handicap	80	9,396	618	12,974	100	1,845	-	-	798	24,215
Retarded	50	9,451	161	2,312	391	7,638	-	-	602	19,401
Emotionally Distrubed Children	135	5,016	268	2,891	276	4,428	-	-	679	12,335
Physical Handicap	19	2,078	113	5,966	52	1,812	-	-	184	9,856
Alcohol/Drug	51	1,491	27	634	148	3,577	-	-	276	5,702
Transient	8	1,066	8	194	47	1,942	-	-	63	3,202
Delinquent	30	1,422	24	263	36	559	-	-	90	2,244
Unmarried Mother	3	116	2	53	25	486	-	-	30	655
Other	18	626	114	1,653	130	2,097	-	-	262	4,376
TOTAL	1,039	86,707	2,519	79,424	1,583	55,895	2	219	5,143	222,245

TABLE 4.5

DISTRIBUTION OF SPECIAL CARE FACILITIES AND BEDS IN CANADA, BY SIZE CATEGORY

31 MARCH 1981

SIZE CATEG.	FACILITIES NO.	FACILITIES % OF TOT.	BEDS NO.	BEDS % OF TOT.
1-24	2,936	57.1	31,789	14.3
25-49	846	16.5	29,962	13.5
50-99	793	15.4	53,858	24.2
100-199	392	7.6	51,700	23.3
200-299	124	2.4	29,767	13.4
300-499	41	0.8	14,835	6.7
500-799	6	0.1	3,948	1.8
800-1999	4	0.1	4,346	2.0
2000 +	1	0.0	2,100	1.0
TOTAL	5,143	100	222,305	100

NOTE: The above information has been summarized from Tables C.2 through C.5.

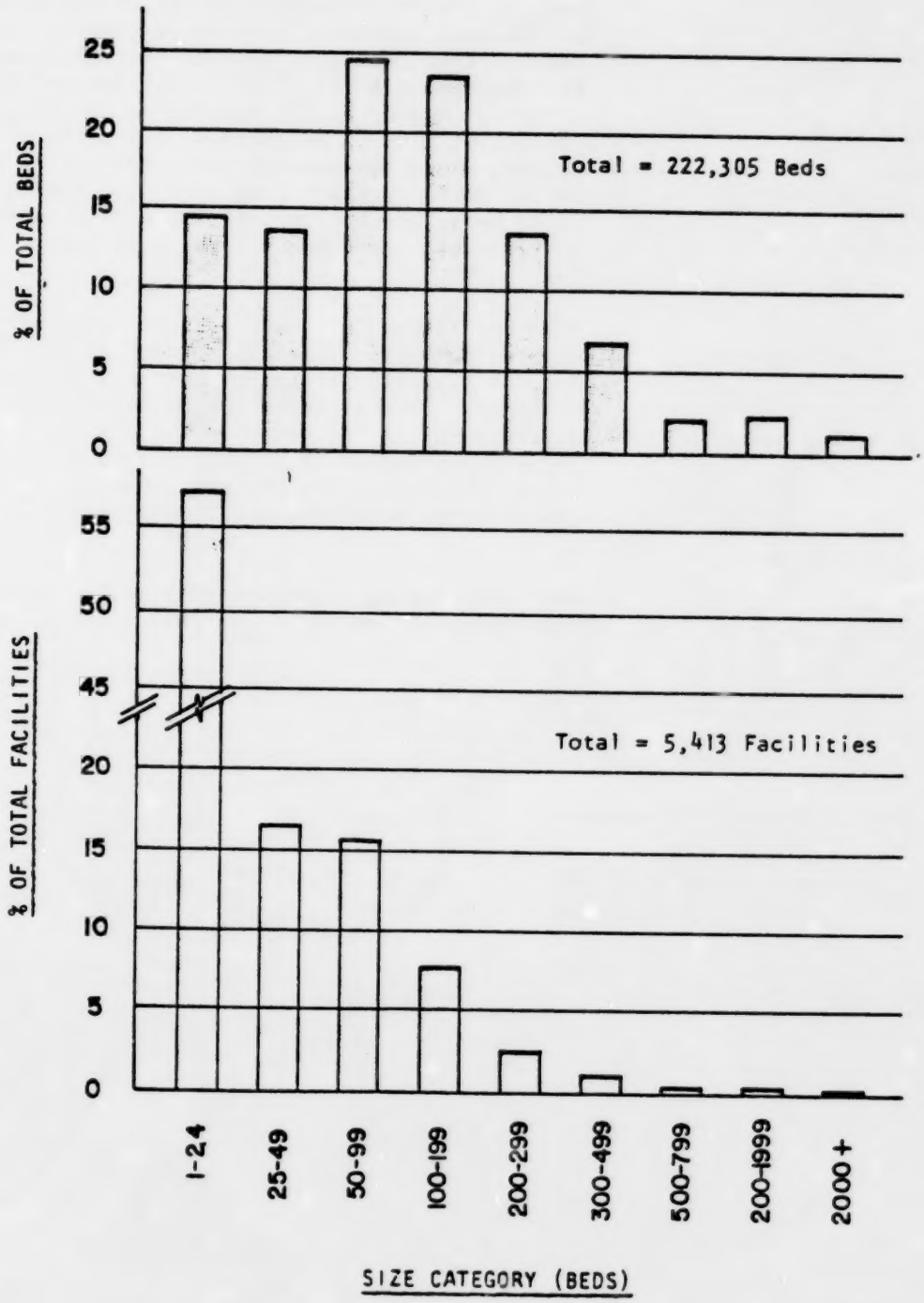


FIGURE 4.3 Percentage distribution of special care facilities and beds in Canada, by size category.

The distribution of special care facilities and beds by province is tabulated in Table 4.6 and illustrated in Figure 4.4. Ontario and Quebec account for 52.4% of the total facilities, and 59.3% of the total beds in Canada. The four Western provinces account for 34.8% and 31.3% of the beds and facilities respectively, while the Maritime provinces and Territories account for the remaining 12.7% of facilities and 9.4% of beds. Again, as for hospitals, the larger facilities tend to be located in Ontario and Quebec, where the average facility size is 49 beds. In the Western provinces, the average size is 39 beds, and in the Maritime provinces and Territories, the average size is 32 beds.

4.3 Facilities for the Provision of Out-of-Hospital Insured Services There is a total of 575 facilities for the provision of out-of-hospital insured services in Canada. The distribution of these facilities, by province, is indicated in Table 4.7. Ontario (62.4%) and Quebec (8.7%) together account for 71.1% of these facilities, the Western provinces 27.5%, and the Maritime provinces and Territories 1.4%.

No further demographic information on these facilities was gathered for this study.

TABLE 4.6

DISTRIBUTION OF SPECIAL CARE FACILITIES AND BEDS IN CANADA, BY PROVINCE

31 MARCH 1981

PROVINCE OR TERRITORY	FACILITIES NO.	FACILITIES % OF TOT.	BEDS NO.	BEDS % OF TOT.
NFLD	107	2.1	3,781	1.7
PEI	51	1.0	1,379	0.6
NS	210	4.1	8,477	3.8
NB	262	5.1	6,973	3.1
QUE	802	15.6	44,425	20.0
ONT	1,895	36.8	87,255	39.3
MAN	352	6.8	12,112	5.4
SASK	230	4.5	10,141	4.6
ALTA	498	9.7	22,772	10.2
BC	712	13.8	24,646	11.1
YUKON	12	0.2	198	0.1
NWT	12	0.2	146	0.1
CANADA	5,143	100	222,305	100

NOTE: The above information has been summarized from Tables C.2 Through C.5.

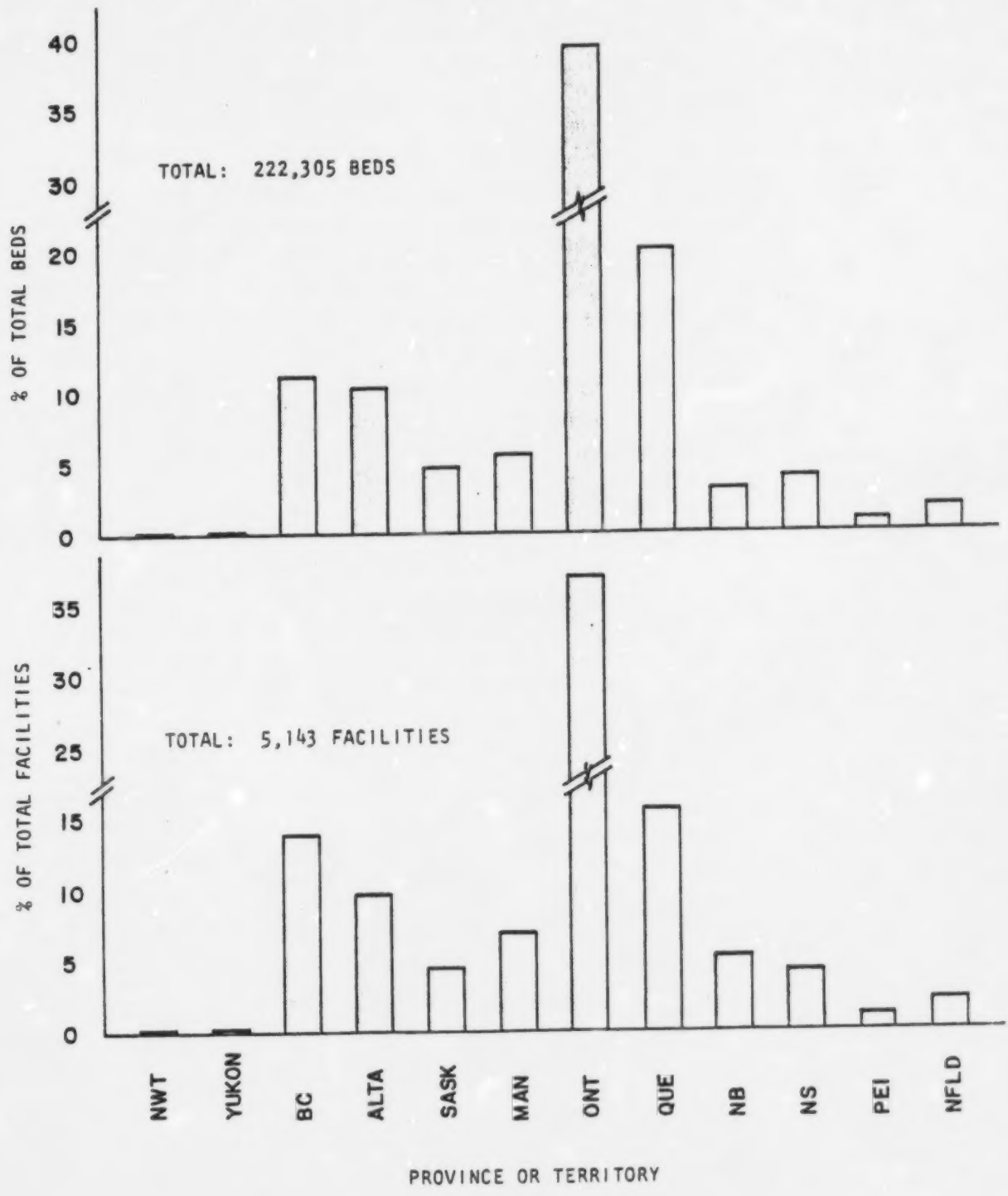


FIGURE 4.4 Percentage Distribution of Special Care Facilities and Beds in Canada, by Province.

TABLE 4.7

FACILITIES FOR THE PROVISION OF OUT-OF-HOSPITAL INSURED SERVICES IN CANADA

31 MARCH 1981

PROVINCE OR TERRITORY	NUMBER OF FACILITIES	% OF TOTAL
NFLD	1	0.2
PEI	2	0.3
NS	4	0.7
NB	1	0.2
QUE	50	8.7
ONT	359	62.4
MAN	33	5.7
SASK	28	4.9
ALTA	42	7.3
BC	55	9.6
YUKON	-	-
NWT	-	-
CANADA	575	100

This section is divided into two main parts; energy consumption in hospitals, and energy consumption in special care facilities. Energy consumption in hospitals has received the most attention here because of sufficient available information, including the results of the recently-completed survey «10» of energy consumption in Canadian hospitals. Due to lack of information, no attempt has been made to discuss energy consumption in facilities for the provision of out-of-hospital insured services.

5.1 Energy Consumption in Hospitals. It is thought that energy costs accounted for approximately 2-4% of the total operating budget in Canadian hospitals in 1982. While this may, at first glance seem so small as not to warrant further attention, it is noted that the 1982 operating budget of 1,037 public hospitals in Canada was approximately $10.4 billion. This means that the energy costs for those hospitals was between $208 million and $416 million in 1982. If a significant proportion of this energy expense could be eliminated (say 10-30%) through improvements in energy utilization and management, then perhaps a closer look at energy consumption in hospitals would prove worthwhile.

How much energy do hospitals in Canada consume, and how is this energy used?

The second part of this question has already been addressed by others, on a case-study basis. A typical breakdown of hospital energy end-uses, in terms of costs, is shown below «14».

HVAC	40-60%
Laundry	8-20%
Lighting	10-20%
Food Services	5-10%
Medical Equipment	3- 5%
Sterilizers, Incinerators, etc.	2%

While this distribution may be typical, the actual distribution of energy in hospitals "varies considerably depending upon a number of factors including geographical location, standards of lighting and ventilation, and requirements for processing including kitchen, laundry, and central sterilizing" «13».

In order to assess more accurately the magnitude of energy consumption in hospitals, as well as to quantify the energy performance of hospitals (e.g. in terms of energy consumption per square metre) a survey of 541 hospitals in Canada was recently undertaken «10». The reported consumption covered the fiscal year ending 31 March 1981. The results of this survey are described in detail in Appendix D. From these results, two "energy indices" were calculated, namely:

a) Energy consumption per gross heated area (G.J./M^2)
b) Energy consumption per bed (G.J./Bed)

In Figure 5.1, these two indices have been plotted against hospital size (in terms of beds). The picture obtained gives rise to two important observations:

i) The energy performance of a hospital varies significantly with the size of the hospital.

ii) The energy consumption per bed (G.J./Bed) bears a close resemblance to the more traditional measure of energy consumption per unit area (G.J./M^2).

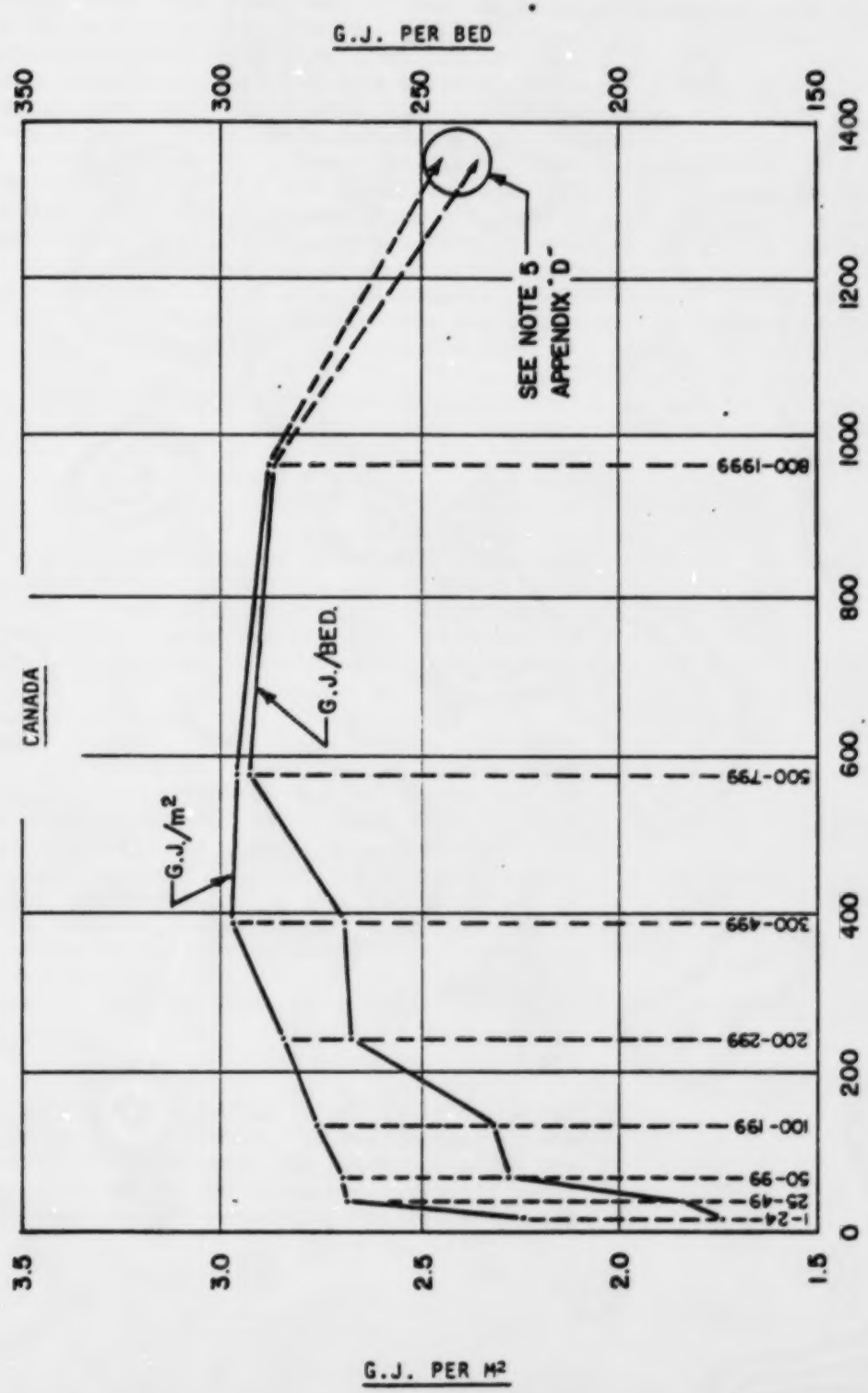


FIGURE 5.1
VARIATION OF ENERGY INDICES
WITH HOSPITAL SIZE CATEGORY

An additional important observation concerns the ranges of values for the two energy indices. From Table D.1, all Canada, we see that G.J./M² varied from 0.48 to 5.67, while G.J./Bed varied from 25.8 to 1,544. Thus, while the average values of these two indices followed very similar trends, the range of values for G.J./Bed is much wider than that for G.J./M². Obviously, energy consumption per unit area (G.J./M²) is a truer measure of building energy performance than energy consumption per bed (G.J./Bed). A building's energy performance does not depend directly on how many pieces of furniture (or beds) are in that building. For this reason, the energy-per-bed index must be used with caution when comparisons are made for individual hospitals. However, for estimating the total energy consumption of a large number of hospitals, it will prove to be a useful tool.

It is doubtful that a complete, centrally-located inventory of hospital floor area exists in Canada at this time. While such an inventory could be assembled by accumulating the data already collected by the provincial jurisdictions, and by filling in any gaps by obtaining additional information from individual hospitals, such an undertaking would require a substantial effort. For this reason, the energy index per unit area (G.J./M²) is presently of little value in estimating energy consumption for the total population of Canadian hospitals.

However, a complete profile of hospitals and hospital beds is readily available from Statistics Canada, and has been discussed in Section 4 of this report. Also, a profile of energy consumption on a per-bed basis has been established, based on the results of the "Task Force" survey. Therefore, with the exception of possible doubts concerning accuracy (which will be addressed later), we have all the necessary ingredients for estimating the energy consumption for the total population of Canadian hospitals. Such an estimate has been prepared, and is presented in detail in Appendix E. The results are summarized below.

Table 5.1 gives the distribution of estimated total energy consumption in Canadian hospitals by province, and Table 5.2 gives the distribution by size category. These distributions are shown graphically in Figure 5.2. The following comments present some of the highlights.

a) The total estimated energy consumption in Canadian hospitals, for the fiscal year ending on 31 March 1981, is 48.7×10^6 G.J.

b) Ontario and Quebec together account for 63.6% of the total consumption (compared with 41.3% of the hospitals, and 60.7% of the beds).

c) The four Western provinces account for 27.3% of the total consumption (compared with 42.9% of the hospitals and 29.9% of the beds).

d) The Maritime provinces and Territories account for 9.1% of the total consumption (compared with 15.8% of the hospitals and 9.3% of hospital beds).

e) Those hospitals with 300 or more beds account for 62.4% of the total consumption (compared with 15.3% of the total number of hospitals, and 59.3% of beds). Hospitals with 100 or more beds account for 88.2% of the total energy consumption (compared with 37.5% of the total number of hospitals, and 85.7% of the total number of beds).

TABLE 5.1

DISTRIBUTION OF ESTIMATED TOTAL ENERGY CONSUMPTION IN CANADIAN HOSPITALS, BY PROVINCE

1 APRIL TO 31 MARCH 1981

PROVINCE OR TERRITORY	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	TOTAL ENERGY CONSUMPTION (G.J.)	% OF TOTAL
NFLD	48	3,835	940,152	1.9
PEI	12	986	230,529	0.5
NS	55	6,499	1,613,364	3.3
NB	36	5,385	1,528,010	3.1
QUE	248	53,507	13,269,472	27.2
ONT	284	59,611	17,749,461	36.4
MAN	107	8,087	1,784,602	3.7
SASK	145	8,466	1,754,351	3.6
ALTA	160	17,239	4,295,913	8.8
BC	141	21,981	5,461,581	11.2
YUKON	6	161	34,854	0.1
NWT	46	403	80,270	0.2
TOTAL	1,288	186,160	48,742,559	100

NOTE: The above values were compiled from Table E.1

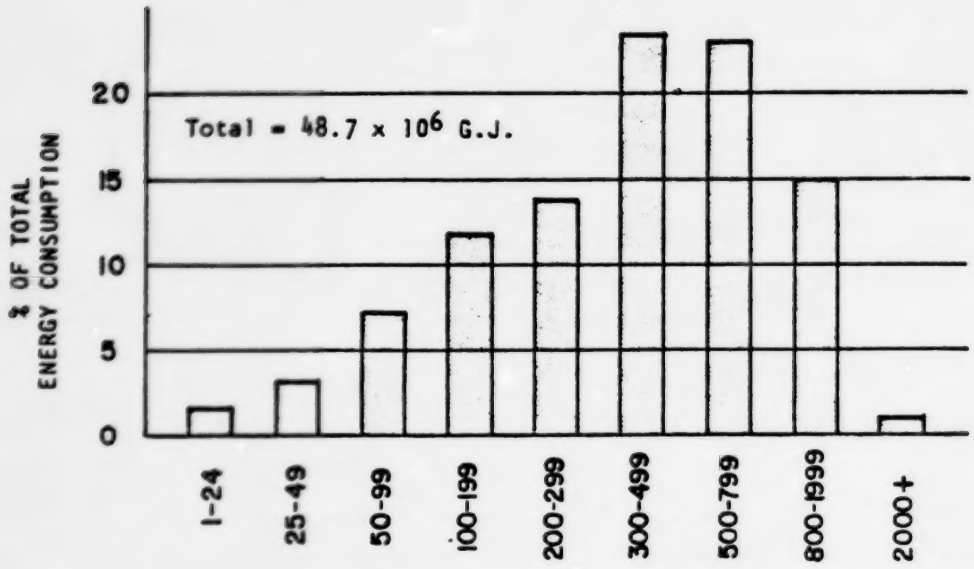
TABLE 5.2

DISTRIBUTION OF ESTIMATED TOTAL ENERGY CONSUMPTION IN CANADIAN HOSPITALS, BY SIZE CATEGORY

1 APRIL 1980 TO 31 MARCH 1981

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	TOTAL ENERGY CONSUMPTION (G.J.)	% OF TOTAL
1-24	368	4,416	759,032	1.6
25-49	229	8,008	1,551,895	3.2
50-99	207	14,139	3,485,113	7.2
100-199	182	24,223	5,767,233	11.9
200-299	104	25,021	6,778,955	13.9
300-499	110	42,592	11,451,596	23.5
500-799	61	37,237	11,188,559	23.0
800-1999	25	25,505	7,255,149	14.9
2000 +	2	5,019	477,307	1.0
TOTAL	1,288	186,160	48,742,559	100

NOTE: The above values were compiled from Table E.1



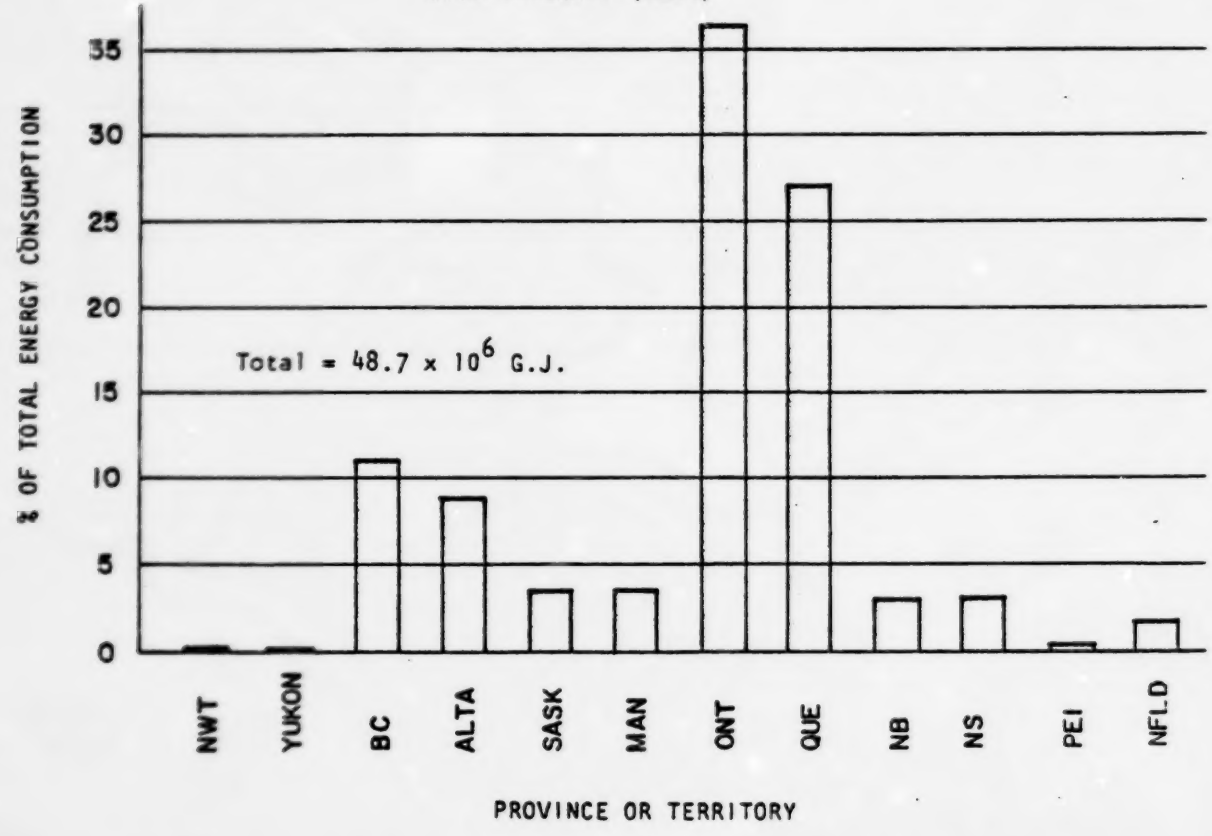


FIGURE 5.2 Percentage Distribution of Total Estimated Energy Consumption in Canadian Hospitals, by Province and by Size Category.

Several approaches have been used to assess the accuracy and consistency (with other data) of the above results. These are discussed below.

i) The methodology used to obtain the estimated total energy consumption (48.7×10^6 G.J.) discussed above has been referred to as "method 1" in Appendix E. This consisted of multyplying the survey-obtained energy index (G.J./Bed), for a particular size category in a particular province, by the number of hospital beds in that size category and province, then summing the resulting consumptions in each size category to obtain the consumption for the province, and finally summing the provincial consumptions to obtain the total estimated consumption in Canada.

A variation of this method, "method 2", consisted of multyplying the survey-obtained energy index, for a particular size category in all Canada, by the number of beds in that size category in Canada, and summing the consumptions obtained in each size category to obtain the total estimated consumption in Canada. This method gave a total estimated consumption of 47.9×10^6 G.J., which is 1.6% less than that obtained by method 1. The advantage of this method is that the energy index in each size category is based on a much larger sample size. The disadvantage of this method is that it loses consideration of possible real differences in the provincial situations (as for instance climate, influence of different unit energy costs on consumption, and differences in standards - e.g. lighting, ventilation, space per bed, etc).

A third method to estimate the total energy consumption in Canadian hospitals, "method 3" consisted of multiplying the survey-obtained energy consumption per hospital, in each size category, by the number of hospitals in that size category, and summing the resultant total consumption in each size category to obtain the total consumption for Canada. This method gave a total estimated consumption of 47.1×10^6 G.J., which is 3.3% less than that obtained by "method 1". It is interesting to note that even such a crude method gives very similar results.

ii) Independent (from the "Task Force" survey) monitoring of energy consumption in Ontario hospitals by the Ontario Ministry of Health «8» has permitted establishment of energy indices (G.J./Bed) based on 182 (out of 284) hospitals in Ontario (see Appendix F). Multiplication of these indices in each size category, by the total number of hospital beds in Ontario in each size category, and subsequent addition of the calculated consumption in each size category, results in a total estimated energy consumption of 15.9×10^6 G.J. for the fiscal year ending on 31 March 1981. This is 10.4% less than the 17.7×10^6 G.J. obtained for Ontario by "method 1".

iii) Independent (from the "Task Force" survey) monitoring of energy consumption in New Brunswick hospitals by the New Brunswick Department of Health «9» indicates that the total energy consumption in New Brunswick hospitals for the fiscal year ending on 31 March 1981 was 1.384×10^6 G.J. (see Appendix G). This is 9.4% less than the 1.528×10^6 G.J. estimated for New Brunswick by "method 1".

While in all likelihood the estimated (by "method 1") consumptions for all provinces are sometimes greater and sometimes less than the actual provincial energy consumptions, resulting in a compensating effect when the total consumption for Canada is calculated, it is neverthless uncertain that this will be the case. From the foregoing discussion, therefore it seems reasonable to suggest that the total estimated energy consumption in Canadian hospitals, namely 48.7×10^6 G.J., is probably accurate within approximately $\pm$ 10%.

5.2 Energy Consumption in Special Care Facilities

There is some information available on energy consumption in special care facilities, but not in a nicely-condensed form as for hospitals. It exists mostly as case studies or partial surveys, neither of which sources have been researched in depth for the present study.

If nursing homes could be considered typical of most special care facilities, then the two examples in Table 5.3 would illustrate the possible breakdowns of energy end-uses in special care facilities.

DESCRIPTION OF FACILITY AND ENERGY USE	NURSING HOME "A"	NURSING HOME "B"
Number of beds	61	100
Number of square feet	12,000	30,000
Approximate age - years	15	10
Annual gross revenues	$720,000.	$1,300,000.
Percentage occupancy	90-95%	N/A
Number of day-shift staff	N/A	50
Fuel types	Gas/Elect.	All elect.
% of energy cost for:		
HVAC	62	47
Laundry	13	14
Lighting	5	11
Kitchen	2	17
Domestic hot water	16	11
Miscellaneous	2	-

Table 5.3 Breakdown of energy-use costs for Two different nursing homes «15».

It is apparent that the above distribution of energy-use costs in nursing homes is quite similar to that in hospitals. It is suspected however, that the total energy requirement for a special care facility is somewhat less than that for a hospital of the same size. Some credence to this suspicion is obtained from the following points:

a) Special care facilities do not require such a large amount of energy (as hospitals) for medical equipment, sterilizers, incinerators, etc.

b) Environmental requirements related to HVAC and lighting are probably less severe for special care facilities than for hospitals.

c) A study of the "designed energy performance" of buildings constructed in the U.S. in 1975 and 1976 «16» indicates (see Figure 5.3) that the average annual energy index for hospitals is 190 MBTU/ft² (2.15 G.J./M²), while for non-housekeeping residential buildings, which include hotels, dormitories, nursing homes, sanatariums, it is 95 MBTU/ft² (1.08 G.J./M²). This is a ratio of 2 to 1.

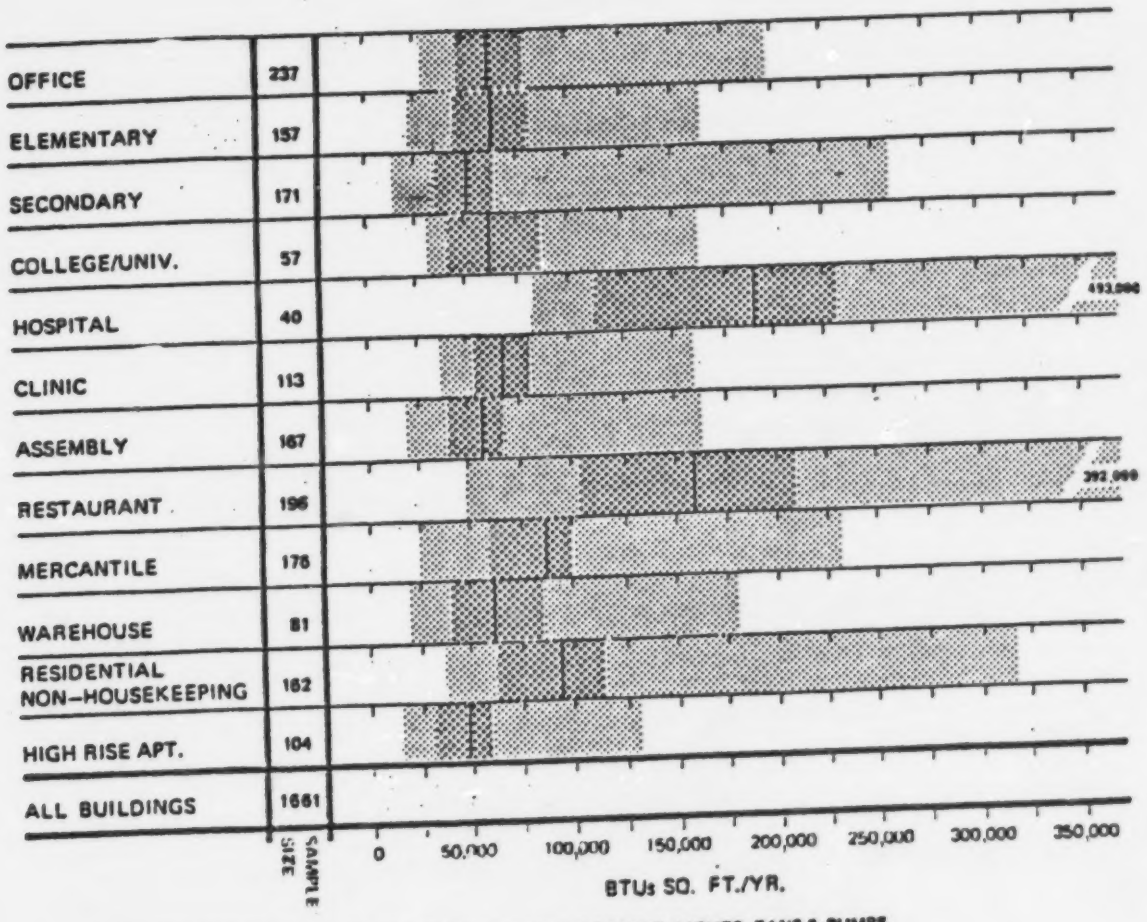


FIGURE 5.3 Designed Energy Performance Distribution, for all Climatic Regions, of Buildings constructed in 1975 and 1976 «16».

In order to obtain a first rough estimate of total energy consumption in special care facilities, it is assumed (from the above) that the energy consumption per unit area in special care facilities in Canada is 50% of the consumption per unit area in hospitals. If we also assume that the space allocation per bed in special care facilities is the same as in hospitals, it then follows that the energy consumption per bed (G.J./Bed) in special care facilities is also 50% of the per-bed consumption in hospitals. On the basis of these assumptions the total energy consumption in canadian special care facilities is estimated to be 24.9×10^6 G.J. for the fiscal year ending 31 March 1981. The details of this estimate are shown in Table 5.4.

Without having substantially more verification of the validity of assumptions and approach taken here to estimate the total energy consumption in special care facilities, the uncertainty of this estimate is fairly high, perhaps in the order of ± 30%.

5.3 Estimated total energy consumption in Health Care Facilities The estimated total energy consumption in health care facilities is now summarized as follows

TYPE OF FACILITIES	ESTIMATED CONSUMPTION (G.J.)	ESTIMATED UNCERTAINTY %
Hospitals	48.7×10^6	± 10%
Special Care Facilities	24.9×10^6	± 30%
Facilities for the provision of out-of hospital insured services	?	?
Total Sector	73.6×10^6	± 17%

TABLE 5.4

ESTIMATED TOTAL ENERGY CONSUMPTION IN CANADIAN SPECIAL CARE FACILITIES

1 APRIL 1980 TO 31 MARCH 1981

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX * (G.J.)/Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	2,936	31,789	87	2,765,643
25-49	846	29,962	92	2,756,504
50-99	793	53,858	114	6,139,812
100-199	392	51,700	116	5,997,200
200-299	124	29,767	133	3,959,011
300-499	41	14,835	135	2,002,725
500-799	6	3,948	146	576,408
800-1999	4	4,346	144	625,824
2000 +	1	2,100	47	98,700
TOTAL	5,143	222,305		24,921,827

* Value indicated is 50% of the value obtained for hospitals by the "Task Force" survey (Ref. Table E.1).

Estimating the potential for energy conservation in a building sector is less straightforward today than it was 8 or even 5 years ago. Eight years ago, when the practical application of conservation measures was just in its early stages in North America, it could be said with reasonable certainty that implementation of the "no cost low cost" measures in a certain building sector would result in a reduction of 10-30% in energy consumption. Today this is no longer, necessarily, the case for a sector as a whole because some (possibly many) buildings in the sector have already benefited from these measures. Now some experts in the field argue that the "no cost low cost measures" are, to a certain extent renewable. That is to say, for example, that the benefits from some initiatives in improved preventive maintenance and improved energy management practices may wear off a few years after initial implementation because of a desensitization effect (i.e. loss of interest) on the part of owners/tenants/operators etc. Some other experts believe that the conservation potential has a finite value, and once it's been used up, it should no longer be counted. The answer probably lies somewhere between these two views. In any case, the historical knowledge of the energy performance and conservation programs in a sector would be useful in order to estimate the potential for conservation at any point in time. The following discussion on conservation potential is presented without due consideration of the history of energy conservation in Canadian Health Care Facilities, and should therefore be regarded in this context.

6.1 Conservation Potential in Hospitals The "Task Force" has identified six significant energy end-uses in Canadian hospitals. Given in descending order of their energy conservation potential, they are «14»:

i) HVAC Systems
ii) Laundry Systems
iii) Lighting
iv) Food Service Systems
v) Medical Equipment
vi) Sterilizers, Incinerators, Miscellaneous, etc.

In a report of energy audits in 48 hospitals in the U.S. between 1978 and 1980, E. Hirst et al «17» have identified a potential energy saving of 1.1 G.J./M², which is equivalent to 20% of the baseline energy use (5.4 G.J./M²) at these hospitals. The following chart includes the more significant measures, the percentage of total energy saving represented by each measure, and the average payback associated with each measure.

RECOMMENDATION	PERCENT OF TOTAL ENERGY SAVING	AVERAGE PAYBACK (YEARS)
Shut down air handlers and/or exhaust fans	26.5	0.6
Adjust HVAC temperatures to match loads	11.0	1.0
Delamping	7.2	0.3
Improve boiler combustion efficiency	5.6	0.4
Repair/replace steam traps	5.5	1.6
Reduce HVAC fan capacity	4.6	0.5
Shut down chiller in winter	4.5	0.5
Insulate piping	4.1	1.5
Eliminate simultaneous heating and cooling	3.9	0.7
Blowdown heat recovery	3.6	2.8
Total	76.5	

TABLE 6.1 Significant Conservation Measures in 48 U.S. Hospitals

The authors' have also concluded that large potential savings will be found at hospitals that are particularly energy-intensive and that have low fuel prices.

In a study released in June 1980 «13», A.W. Cluff et al state: "Studies by engineering firms indicate that with proper energy conservation planning, hospitals can reduce their energy cost from 10% to 30% with modest capital expenditure. A typical energy requirement for hospitals equipped with energy conservation installations has been shown with a target total energy requirement of 64 kWH/ft²/year (2.48 G.J./M²) and may be compared with earlier typical hospital requirements of 99 kWH/ft²/year (3.83 G.J./M²)".

	NOT EQUIPPED	EQUIPPED
Building Fabric	6	4
Terminal Reheat	18	6
Ventilation/Humidification	27	12
Domestic Hot Water	8	7
Sterilizers/Processing	6	6
Kitchen and Hospital Equipment	7	6
Power and Miscellaneous	8	7
Lighting	14	12
TOTAL	99	64
	kWH/sq.ft./ year	kWH/sq.ft./ year

TABLE 6.2 Comparison of energy requirements of two hospitals, not-equipped, and equipped, with energy conservation installations.

It should be noted that the average energy requirement in FY 80/81 for 508 hospitals surveyed by the "Task Force" was 2.81 G.J./M². This raises some interesting questions:

a) Has most of the conservation potential identified by A.W. Cluff et al already been realized by end March 1981? If yes, then perhaps it has all been achieved by end March 1983.

b) Perhaps 99 kWH/ft²/year (Ref. Cluff et al) was not typical of all Canadian hospitals in 1979 or 1980, but rather typical of a particular size of hospital located in a particular city, etc.

c) Perhaps the "Task Force" survey result of 2.81 G.J./M² is not representative of all 1,288 Canadian hospitals, but only of the 508 surveyed.

We are of the opinion that the 99 kWH/ft²/year (3.83 G.J./M²) may indeed have been typical of a particular type or size of hospital, but not necessarily a reflection of the average situation for all hospitals in Canada. Whether or not the 33% reduction in energy savings represents the average potential for all Canadian hospitals at that time is a difficult question which cannot be answered within the scope of this study.

How then do we predict the potential for energy conservation in Canadian hospitals? The answer is that without further in-depth study, any answer is, at best, an educated guess.

It has been suggested that a target energy use index which can be achieved quite comfortably in existing Canadian hospitals is between 50 and 60 kWH/ft²/year (eg. 1.94 to 2.32 G.J./M². This would represent a reduction of between 17 and 31% of the average energy use index for hospitals (2.81 G.J./M²) at 31 March 1981, and is our best guess at the present time. In energy terms (rather than percent), the potential for energy conservation in Canadian hospitals, as of 31 March 1981, consequently lies between 8.3 and 15.1 x 10^6 G.J. per year.

6.2 Conservation Potential in Special Care Facilities

The same obstacles in predicting conservation potential exist for special care facilities as they did for hospitals.

Recalling the energy-use examples of nursing homes "A" and "B" as presented in Table 5.3, the conservation potentials for those two facilities are shown below «15». Here, the conservation potentials are those which can be achieved with "a moderately intensive conservation program and the investment of some capital for short-payback improvements". It should be remembered that these nursing homes are proprietary institutions where there is probably a greater incentive (e.g. profit) to reduce energy consumption than in public institutions. Hence, it might be argued that the conservation potential in public facilities is larger than in proprietary facilities.

ENERGY USE	CONSERVATION POTENTIAL (% OF TOTAL ENERGY COST) NURSING HOME "A"	NURSING HOME "B"
HVAC	4	3
Laundry	1	9
Lighting	1	1
TOTAL	6%	13%

TABLE 6.3 Conservation Potentials for two different Nursing Homes.

As a first guess, we assume that the conservation potential in special care facilities lies between 8 and 15% of the total energy consumed. Recalling the estimated total annual consumption in special care facilities to be 24.9×10^6 G.J., this means that the roughly-estimated potential for conservation in special care facilities, as of 31 March 1981, is between 2.0 and 3.7×10^6 G.J.

6.3 Total Conservation Potential in Health Care Facilities. The estimated potential for energy conservation in health care facilities is now summarized as follows:

TYPE OF FACILITIES	CONSERVATION POTENTIAL (G.J.)	% OF TOTAL ENERGY CONSUMPTION
Hospitals	8.3×10^6-15.1×10^6	17-31
Special Care Facilities	2.0×10^6-3.7×10^6	8-15
Facilities for the provision of out-of-hospital insured services	?	?
TOTAL	10.3×10^6-18.8×10^6	14-26

The above estimates are very preliminary, and require further study for verification purposes.

7.1 Summary The health care facilities sector has been defined as consisting of

- Hospitals
- Special Care Facilities, and
- Facilities for the provision of out-of-hospital insured services.

Data available from Statistics Canada has permitted the identification of the number of facilities in each case: as of 31 March 1981, there were 1,288 hospitals, 5,143 special care facilities, and 575 facilities for the provision of out-of-hospital insured services in Canada. The number of beds in hospitals and special care facilities is also known, namely 186,160 and 222,305 respectively, as of 31 March 1981. There is no centralized data source for floor area or energy consumption in Canadian health care facilities.

We have found that Ontario and Quebec together account for 41.3% of the hospitals and 60.7% of the hospital beds in Canada. These two provinces also account for 52.4% of the special care facilities, and 59.3% of associated beds in Canada. Finally, we have seen that 62.4% of facilities for the provision of out-of-hospital insured services in Canada are located in Ontario, and Ontario and Quebec together account for 71.1% of these facilities.

We have also found that 15.3% of hospitals have 300 or more beds, and that this represents 59.3% of the total number of hospital beds in Canada. Similarly, 11% of special care facilities have 100 or more beds, representing 48.2% of the total number of beds.

In terms of ownership, 84.7% of hospitals, representing 96.0% of hospital beds, are owned publicly. The remainder are proprietary and federal. For special care facilities, however, public ownership accounts for only 20.2% of the facilities and 39% of the beds. The remainder of the facilities and beds essentially come under proprietary or religious/lay ownership.

Finally, we have generally seen that for both hospitals and special care facilities, the larger facilities (in terms of beds) are publicly-owned, whereas the smaller ones are proprietary or religious/lay.

Energy consumption in Canadian hospitals has been estimated on the basis of quantity of hospital beds and on the results of a survey of 541 hospitals conducted by the Task Force on Energy Management in Health Care Facilities in Canada. It was found from the survey that a close correlation exists between energy consumption per unit area (G.J./M^2) and energy consumption per bed (G.J./Bed). Hence, in the absence of floor area statistics, the total energy consumption in hospitals was obtained, in broad terms, by multiplying the number of beds by the energy consumption per bed. The total energy consumption in Canadian hospitals, between 1 April 1980 and 31 March 1981, was thus estimated to be 48.7×10^6 G.J. The accuracy of this estimate is thought to be within $\pm$ 10%.

Ontario and Quebec together account for 63.6% of the total estimated energy consumption in Canadian hospitals. Hospitals with 300 or more beds account for 62.4% of the total estimated energy consumption.

Energy consumption in special care facilities was estimated, in a much less precise way, to be 24.9×10^6 G.J. The uncertainty of this estimate is fairly high, perhaps in the order of $\pm$ 30%.

The estimated total annual energy consumption in Canadian Health Care Facilities (not counting facilities for the provision of out-of-hospital insured services) is 73.6×10^6 G.J., with an estimated uncertainty of $\pm$ 17%. To put this number into context with the consumption in other sectors, it is noted that all Government of Canada Departments and Agencies (excluding major commercial/industrial users such as Canadian National, Air Canada, and AECL heavy water plants) consumed 78.2×10^6 G.J. during the fiscal year ending 31 March 1981 «18».

A very preliminary estimate of the conservation potential in Canadian hospitals suggests that an achievable target consumption is between 1.94 G.J./M2 and 2.32 G.J./M^2 (i.e. 50-60 kWH/ft^2). On this basis, the conservation potential would be between 8.3×10^6 and 15.1×10^6 G.J. per year. An even rougher estimate of the conservation potential in special care facilities gives between 2.0×10^6 and 3.7×10^6 G.J. per year. Thus, the total conservation potential in the health care sector is estimated to be between 10.3×10^6 and 18.8×10^6 G.J. per year. With energy costs ranging between $5. and $10. per G.J., the conservation potential, in terms of dollars, is between $51.5 million and $188 million annually.

7.2 Recommendations The following recommendations for future work are given in descending order of suggested priority:

a) Initiate work to more clearly define the conservation potential in hospitals. The various possible conservation techniques are well-known. What is needed now is a detailed evaluation of the applicability of these techniques, today, to determine which ones will yield the greatest results (reduced energy consumption) and what those results (savings) will be on a sectoral basis rather than on a "typical" case-study basis. Since an estimated 40-60% of hospital energy consumption is used for HVAC, this would be a good place to start. Also, since conservation potential is expected to be large among energy-intensive hospitals with low fuel costs (which also tend to be located in Ontario and Quebec), and since Ontario/Quebec account for such a large proportion (63.6%) of total energy consumed in Canadian hospitals, these two provinces would be good choices of where to begin this work.

b) In parallel with (a) above, undertake work to confirm the energy end-use distribution in hospitals, and particularly, to determine differences due to hospital size (as suggested by energy indices in Figure 5.1), location, type, etc.

c) Initiate work to provide a more refined estimate of energy consumption in special care facilities. A recently-completed survey «11» would be a useful input, as would information which can probably be obtained from some provincial jurisdictions.

d) Upon completion of (c), undertake work to more clearly define the conservation potential in special care facilities.

e) Initiate a small study to quantify the sizes (e.g. floor areas) and energy consumptions in the 575 facilities for provision of out-of-hospital insured services.

f) Evaluate the desirability of including currently-excluded facilities (e.g. day-care, crisis) in the health care sector.

g) Initiate a long-term, systematic (annual) collection of energy consumption and related data (e.g. floor area) for all hospitals and special care facilities. This would provide a valuable basis to estimate conservation potential at a given point in time, as well as monitor the success of conservation programs in this sector.

Since the basic infrastructure required to organize and implement such data collection already exists (Statistics Canada and The Canadian Hospital Association), the addition of energy data to their annual survey(s) would be quite feasible, as well as beneficial. This recommendation, it is noted, has already been made previously, by A.W. Cluff et al «13» in June 1980.

h) Further analysis of the existing "Task Force" survey results could reveal some additional valuable information of energy use in Canadian hospitals. Possible mini-studies include disaggregation of data by climatic zone, by construction vintage of buildings, and by use of space (e.g. teaching hospitals vs non-teaching), and separation of the responses of those facilities which are not defined as hospitals by Statistics Canada.

1. "A Study of Data Requirements for Commercial Sector Energy Studies", prepared by Canadian Resourcecon Ltd. for the CAE., Sept. 1981.

2. "Data Base Feasibility Study", prepared by G. Loney and L. Porter for ORF/EMR and the BETT, March 1982.

3. "Elements of an Energy Data Base for the Commercial Sector", prepared by R.W. Burkart for EMR and the BTSP, Oct. 1982.

4. "List of Canadian Hospitals and Special Care Facilities", Statistics Canada Catalogue # 83-201, 1981.

5. "Hospital Annual Statistics", Statistics Canada Catalogue # 83-232, 1977-78.

6. "Mental Health Statistics, Vol. III, Institutional Facilities, Services, and Finances", Statistics Canada Catalogue # 83-205, 1979-80.

7. "Instructions and Definitions for the Annual Return of Health Care Facilities - Hospitals", Parts one and two, Statistics Canada and Health and Welfare Canada.

8. Unpublished Energy Consumption Data for Ontario Public Hospitals, courtesy E.J. Parker, Ontario Ministry of Health, Instutional Planning Branch.

9. Unpublished Energy Consumption Data for New Brunswick Hospitals, courtesy G.B. Seely, New Brunswick Department of Health.

10. Unpublished Survey of Energy Consumption in Canadian Hospitals, 1 April 1980 to 31 March 1981, conducted by the Task Force on Energy Management in Health Care Facilities in Canada, in cooperation with the Canadian Hospital Association.

11. Unpublished Survey of Energy Consumption in Canadian Special Care Facilities located in Non-Gas-Pipeline Areas, conducted by MacLaren Plansearch Inc. for Energy, Mines and Resources Canada, 1983.

12. Unpublished Statistics Canada Custom Report, dated 24 February 1983, on the distribution of hospital beds and special care facility beds, by size category, in Canada, as of 31 March 1981.

13. "Energy Conservation in Hospitals: Review of the Canadian and U.S. Studies, Surveys, Programs, and Publications", by A.W. Cluff and P.J. Cluff, Toronto, and The E.C.E. Group, Toronto, June 1980.

14. "Energy Management in Canadian Health Care Facilities" - Technical Manual and Administrative Manual, by the Task Force on Energy Management in Health Care Facilities in Canada, June 1982.

15. "Reducing Energy Costs in Nursing Homes", American Health Care Association, 1981.

16. "Phase One/Base Data for the Development of Energy Performance Standards for New Buildings - Final Report", AIA Research Corporation, Oct. 1978.

17. "Analysis of Energy Audits at 48 Hospitals", E. Hirst et al; Oak Ridge National Laboratory, Oak Ridge, Tennessee, July 1981.

18. "Government of Canada Internal Energy Conservation Program - Fifth Annual Report 1981", Energy Mines and Resources Canada, 1982.

ANNOTATED BIBLIOGRAPHY

(Excluding unpublished materials which have been separately referenced throughout this report)

TITLE	List of Canadian Hospitals and Special Care Facilities - 1981.
AUTHOR(s)	Statistics Canada, Health Division, Institutional Statistics Section.
PUBLISHER/DATE/PAGES	Minister of Supply & Services Canada/ February 1982/278 pages.
AVAILABLE FROM/PRICE	Publication Sales & Services Statistics Canada Ottawa, K1A 0V7 $15.00
CATALOGUE & INDEXING NUMBERS	Statistics Canada Catalogue # 83-201 ISSN 0225-5642.
KEY WORDS	Hospitals, Special Care Facilities, Health Care Facilities
SECTOR APPLICABILITY	Health Care

ABSTRACT

This is an annual publication which lists the name, province and municipality, type of facility and type of ownership, and number of approved beds for Canadian Hospitals and Special Care Facilities. Also included is a listing of facilities for the provision of out-of- hospital insured services. Summary tabulations are provided. This publication is prepared on the basis of annual information received from the various Provincial Ministries/ Departments of Health.

TITLE	Hospital Annual Statistics, 1977-78
AUTHOR(s)	Statistics Canada, Health Division, Institutional Statistics Section.
PUBLISHER/DATE/PAGES	Minister of Supply & Services Canada/ June 1981/496 pages.
AVAILABLE FROM/PRICE	Publication Sales and Services Statistics Canada Ottawa, Ont. K1A 0V7 $20.00
CATALOGUE & INDEXING NUMBERS	Statistics Canada Catalogue # 83-232 ISSN 0228-5142
KEY WORDS	Hospitals, Health Care Facilities
SECTOR APPLICABILITY	Health Care

ABSTRACT

This publication is prepared on the basis of information contained in the annual return of Hospitals (excluding Psychiatric Hospitals). There are numerous tables detailing the number of Hospitals, number of beds, type of services, Patient-Days, rate of occupancy, income and operating costs, etc.

TITLE	Mental Health Statistics, Vol. III Institutional Facilities, Services, and Finances. 1979-80.
AUTHOR(s)	Statistics Canada, Health Division, Institutional Statistics Section.
PUBLISHER/DATE/PAGES	Minister of Supply & Services Canada/ February 1982/50 pages.
AVAILABLE FROM/PRICE	Publication Sales & Services Statistics Canada Ottawa, Ont. K1A 0V7 $6.00
CATALOGUE & INDEXING NUMBERS	Statistics Canada Catalogue # 83-205 ISSN 0380-6545
KEY WORDS	Hospitals, Psychiatric Hospitals, Mental Hospitals, Health Care
SECTOR APPLICABILITY	Health Care

ABSTRACT

This publication is prepared on the basis of information contained in the annual return of Hospitals. Data refers to separate Psychiatric Hospitals, as well as to Psychiatric Wards of General Hospitals. Numerous tables detail the number of institutions, number of beds, type of services and ownership, patient days, rate of occupancy, operating revenues and costs, etc.

TITLE	Instructions and Definitions for the Annual Return of Health Care Facilities
AUTHOR(s)	Statistics Canada - Health & Welfare Canada.
PUBLISHER/DATE/PAGES	Statistics Canada/Annual
AVAILABLE FROM/PRICE	Publication Sales and Services Statistics Canada Ottawa, Ont. K1A 0V7
CATALOGUE & INDEXING NUMBERS	
KEY WORDS	Hospitals, Special Care Facilities, Survey, Annual Return.
SECTOR APPLICABILITY	Health Care

ABSTRACT

This is printed in three parts:
- Hospitals, part one
- Hospitals, part two
- Residential Care Facilities

Instructions are provided to assist in the completion of Statistics Canada Annual Survey of Health Care Facilities in Canada. Definitions, as well as the complete questionnaires, are included.

TITLE	Canadian Hospital Directory - 1982
AUTHOR(s)	Canadian Hospital Association
PUBLISHER/DATE/PAGES	Canadian Hospital Association/ September 1982/337 pages.
AVAILABLE FROM/PRICE	Canadian Hospital Association 410 Laurier Ave. West Ottawa, Ont. K1R 7T6 $37.50
CATALOGUE & INDEXING NUMBERS	ISSN 0068-8932
KEY WORDS	Hospital, Health Care Facility
SECTOR APPLICABILITY	Health Care

ABSTRACT

This annual publication lists the name, address, type of facility and type of ownership, and number of approved beds for Canadian Hospitals. Summary tabulations are provided.

TITLE	Directory of Long-Term Care Centres in Canada - 1982
AUTHOR(s)	Canadian Hospital Association
PUBLISHER/DATE/PAGES	Canadian Hospital Association/ February 1982/186 pages.
AVAILABLE FROM/PRICE	Canadian Hospital Association 410 Laurier Ave. West Ottawa, Ont. K1R 7T6 $20.00
CATALOGUE & INDEXING NUMBERS	ISSN 0226-5419
KEY WORDS	Long-Term Care Centres, Special Care Facilities
SECTOR APPLICABILITY	Health Care

ABSTRACT

This annual publication lists the name, address, type of facility and type of ownership, and number of approved beds for Canadian Long-Term Care Centres. Summary tabulations are provided.

TITLE	Government of Canada Internal Energy Conservation Program - 5th Annual Report 1981.
AUTHOR(s)	Energy, Mines and Resources Canada
PUBLISHER/DATE/PAGES	Minister of Supply and Services Canada/ 1982/35 pages.
AVAILABLE FROM/PRICE	Energy, Mines and Resources Canada 580 Booth Street Ottawa, Ont. K1A 0E4
CATALOGUE & INDEXING NUMBERS	Cat. No. M23-13/82-3 ISBN 0-662-52124-2
KEY WORDS	Energy Conservation, Government of Canada
SECTOR APPLICABILITY	Federal Government

ABSTRACT

This document reports the energy consumption of most Federal Government Departments during FY1980-81, and makes comparisons with previous years' consumptions. Achievements in reduced energy consumption are evaluated in the context of the various aspects of the Government's Internal Energy Conservation Program.

TITLE	Energy Conservation in Hospitals: Review of the Canadian and U.S. Studies, Surveys, Programs and Publications
AUTHOR(s)	A.W. Cluff & P.J. Cluff, Toronto, and The E.C.E. Group, Toronto
PUBLISHER/DATE/PAGES	Energy Mines and Resources Canada/ June 1980/198 pages.
AVAILABLE FROM/PRICE	Energy Mines and Resources Canada 580 Booth Street Ottawa, Ont. K1A 0E4
CATALOGUE & INDEXING NUMBERS	Building Series Publication # 2d, 1979
KEY WORDS	Hospitals, Energy Conservation
SECTOR APPLICABILITY	Health Care

ABSTRACT

This report examines existing studies, surveys, programs, and publications related to energy conservation in Hospitals. Also included are the characteristics of the Hospital Sector in terms of size, energy consumption, conservation potential, attitudes toward energy management, etc.

TITLE	Energy Management in Canadian Health Care Facilities - Technical Manual and Administrative Manual
AUTHOR(s)	Task Force on Energy Management in Health Care Facilities in Canada.
PUBLISHER/DATE/PAGES	Task Force/July 1982/157 pages Tech. Manual and 90 pages Admin. Manual.
AVAILABLE FROM/PRICE	Task Force on Energy Management in Health Care Facilities in Canada 410 Laurier Ave. W., Suite 800 Ottawa, Ont. K1R 7T6
CATALOGUE & INDEXING NUMBERS	
KEY WORDS	Hospitals, Health Care Facilities, Energy Management
SECTOR APPLICABILITY	Health Care

ABSTRACT

These two manuals address the various administrative and technical aspects of Energy Management in Canadian Health Care Facilities. Emphasis is placed on providing the information and approach required to implement a comprehensive energy management program.

TITLE	Analysis of Energy Audits at 48 Hospitals
AUTHOR(s)	E. Hirst, et al., Oak Ridge Associated Universities.
PUBLISHER/DATE/PAGES	Oak Ridge National Laboratory/ July 1981/37 pages.
AVAILABLE FROM/PRICE	National Technical Information Service U.S. Department of Commerce 5285 Port Royal Road Springfield, Virginia, 22161
CATALOGUE & INDEXING NUMBERS	ORNL/CON-77
KEY WORDS	Hospitals, Health Care Facilities, Energy Audits
SECTOR APPLICABILITY	Health Care

ABSTRACT

This report summarizes and discusses the results of Energy Audits conducted at 48 U.S. Hospitals. Average annual energy use was found to be 5.4 G.J./M^2 or 472 G.J./bed. The average potential for reduction of annual energy consumption was found to be 1,1 G.J./M^2 (20%), at a cost of \$2.65/m^2 with an average payback period of one year. The largest potential for savings was found to be at hospitals that were particularly energy intensive, and that were subject to relatively low fuel prices.

TITLE	Phase One/Base Data for the Development of Energy Performance Standards for New Buildings - Final Report
AUTHOR(s)	AIA Research Corporation
PUBLISHER/DATE/PAGES	U.S. Dept. of Energy/October 1978/111 pages
AVAILABLE FROM/PRICE	National Technical Information Service U.S. Department of Commerce 5285 Port Royal Road Springfield, Virginia 22161 $6.50
CATALOGUE & INDEXING NUMBERS	TID-28819
KEY WORDS	Energy Performance Standards, New Buildings
SECTOR APPLICABILITY	Buildings

ABSTRACT

This report documents research on the designed energy performance of buildings constructed in the U.S. in 1975 and 1976. The energy consumption of each of the sample buildings was calculated from design data (collected in a survey) using a computer simulation program.

TITLE	"Reducing Energy Costs in Nursing Homes"
AUTHOR(s)	Xenergy Inc., Burlington, Mass.; Center for Information Sharing, Boston, Mass.; and the American Health Care Association.
PUBLISHER/DATE/PAGES	American Health Care Association/1981/ 53 pages.
AVAILABLE FROM/PRICE	American Health Care Association 1200, 15th Street Washington, DC 20005 USA
CATALOGUE & INDEXING NUMBERS	DOE/CS/20295--5 DE82 006142
KEY WORDS	Nursing Homes, Special Care Facilities, Energy Costs, Energy Conservation
SECTOR APPLICABILITY	Health Care

ABSTRACT

This handbook presents a variety of energy-saving recommendations, together with a "how-to" approach for identifying, evaluating, and implementing energy saving measures in nursing homes. The handbook is based on operating experience in proprietary nursing home facilities, in the 25-100 bed size ranges, and of the "intermediate care" type. The authors beli ve that the findings apply to most long term care facilities.

Hospital Population Demographics and Related Data

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TABLE B.1

DISTRIBUTION OF HOSPITALS AND HOSPITAL BEDS IN CANADA, BY TYPE OF SERVICE AND BY CATEGORY

31 MARCH 1981

TYPE OF SERVICE		CATEGORY						TOTAL	
		PUBLIC		PROPRIETARY		FEDERAL			
		Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds
GENERAL	Sub-Total	861	127,348	6	300	16	1,531	883	129,179
ALLIED SPECIAL	Pediatric	8	2,919	-	-	-	-	8	2,919
	Rehab. & Extend. Care (1)	149	32,595	50	2,997	1	1,130	200	36,722
	Other (2)	36	2,757	4	120	114	667	154	3,544
	Sub-Total	193	38,271	54	3,117	115	1,797	362	43,185
PSYCHIATRIC DISORDERS	Alcoholic	3	193	-	-	-	-	3	193
	Mental	26	11,916	-	-	-	-	26	11,916
	Psychiatric	8	1,007	3	342	3	338	43	1,687
	Other (3)	-	-	-	-	-	-	-	-
	Sub-Total	37	13,116	3	342	3	338	43	13,796
	TOTAL	1,091	178,735	63	3,759	134	3,666	1,288	186,160

NOTES: (1) Includes Convalescent and Chronic
(2) Includes Maternity, Orthopedic, Neurological, Cancer, Outpost Hospitals, etc.
(3) Includes Emotionally Disturbed Children, Epileptic, and Mental other.

TABLE B.2

DISTRIBUTION OF HOSPITALS IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	23	10	4	4	3	4	-	-	-	48
PEI	4	1	3	3	1	-	-	-	-	12
NS	13	6	14	13	4	4	-	1	-	55
NB	7	7	8	5	3	2	4	-	-	36
QUE	26	35	40	58	35	28	18	6	2	248
ONT	39	39	47	49	35	42	24	9	-	284
MAN	64	18	8	6	1	8	-	2	-	107
SASK	80	30	13	9	4	8	1	-	-	145
ALTA	25	58	44	13	5	5	7	3	-	160
BC	41	23	23	21	13	9	7	4	-	141
YUKON	5	-	-	1	-	-	-	-	-	6
NWT	41	2	3	-	-	-	-	-	-	46
CANADA	368	229	207	182	104	110	61	25	2	1,288

TABLE B.3

DISTRIBUTION OF HOSPITAL BEDS IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	323	344	247	562	783	1,576	-	-	-	3,835
PEI	68	33	150	495	240	-	-	-	-	986
NS	207	222	980	1,812	911	1,560	-	807	-	6,499
NB	110	277	609	575	661	802	2,351	-	-	5,385
QUE	343	1,329	2,801	7,715	8,598	10,689	11,347	5,666	5,019	53,507
ONT	512	1,436	3,483	6,576	8,485	16,403	14,367	8,349	-	59,611
MAN	755	574	539	699	252	3,179	-	2,089	-	8,087
SASK	1,122	987	902	1,134	897	2,878	546	-	-	8,466
ALTA	373	1,936	2,603	1,694	1,073	1,969	4,489	3,102	-	17,239
BC	395	811	1,648	2,841	3,121	3,536	4,137	5,492	-	21,981
YUKON	41	-	-	120	-	-	-	-	-	161
NWT	167	59	177	-	-	-	-	-	-	403
CANADA	4,416	8,008	14,139	24,223	25,021	42,592	37,237	25,505	5,109	186,160

TABLE B.4

PERCENTAGE DISTRIBUTION OF HOSPITALS IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	1.786	0.776	0.311	0.311	0.233	0.311	-	-	-	3.727
PEI	0.311	0.078	0.233	0.233	0.078	-	-	-	-	0.932
NS	1.009	0.466	1.087	1.009	0.311	0.311	-	0.078	-	4.270
NB	0.543	0.543	0.621	0.388	0.233	0.155	0.311	-	-	2.795
QUE	2.019	2.717	3.106	4.503	2.717	2.174	1.398	0.466	0.155	19.255
ONT	3.028	3.028	3.649	3.804	2.717	3.261	1.863	6.988	-	22.050
MAN	4.969	1.398	0.621	0.466	0.078	0.621	-	0.155	-	8.307
SASK	6.211	2.329	1.009	6.988	0.311	0.621	0.078	-	-	11.258
ALTA	1,941	4.503	3.416	1.009	0.388	0.388	0.543	0.233	-	12.422
BC	3.183	1.786	1.786	1.630	1.009	6.988	0.543	0.311	-	10.947
YUKON	0.388	-	-	0.078	-	-	-	-	-	0.466
NWT	3.183	0.155	0.233	-	-	-	-	-	-	3.571
CANADA	28.571	17.780	16.071	14.130	8.075	8.540	4.736	1.941	0.155	100

TABLE B.5

PERCENTAGE DISTRIBUTION OF HOSPITAL BEDS IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	0.174	0.185	0.133	0.302	0.421	0.847	-	-	-	2.060
PEI	0.037	0.018	0.081	0.266	0.129	-	-	-	-	0.530
NS	0.111	0.119	0.526	0.973	0.489	0.838	-	0.434	-	3.491
NB	0.059	0.149	0.327	0.309	0.355	0.431	1.263	-	-	2.893
QUE	0.184	0.714	1.505	4.144	4.619	5.742	6.095	3.044	2.696	28.742
ONT	0.275	0.771	1.871	3.532	4.558	8.811	7.718	4.485	-	32.021
MAN	0.406	0.308	0.290	0.375	0.135	1.708	-	1.122	-	4.344
SASK	0.603	0.530	0.485	0.609	0.482	1.546	0.293	-	-	4.548
ALTA	0.200	1.040	1.398	0.910	0.576	1.058	2.411	1.666	-	9.260
BC	0.212	0.436	0.885	1.526	1.677	1.899	2.222	2.950	-	11.808
YUKON	0.022	-	-	0.064	-	-	-	-	-	0.086
NWT	0.090	0.032	0.095	-	-	-	-	-	-	0.216
CANADA	2.372	4.302	7.595	13.012	13.441	22.879	20.003	13.701	2.696	100

EXPLANATORY NOTES

1. Information contained in Tables B.1 through B.5 is compiled from the following sources:

a) Statistics Canada Catalogue No. 83-201 "List of Canadian Hospitals and Special Care Facilities" 1981.

b) Unpublished Statistics Canada Custom Report, dated 24 February 1983, on Hospital Bed Distribution as of 31 March 1981.

Special Care Facility Population Demographics and Related Data

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TABLE C.1

DISTRIBUTION OF SPECIAL CARE FACILITIES AND BEDS IN CANADA, BY PRINCIPAL CHARACTERISTICS OF PREDOMINANT GROUP OF RESIDENTS, AND BY TYPE OF OWNERSHIP

31 MARCH 1981

PRINCIPAL CHARACTERISTICS OF PREDOMINANT GROUP OF RESIDENTS	TYPE OF OWNERSHIP									
	PUBLIC		PROPRIETARY		RELIG./LAY		FEDERAL		TOTAL	
	Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds	Facil.	Beds
Aged Persons	645	56,045	1,184	52,484	378	31,511	2	219	2,209	140,259
Mental Handicap	80	9,396	618	12,974	100	1,845	-	-	798	24,215
Retarded	50	9,451	161	2,312	391	7,638	-	-	602	19,401
Emotionally Distrubed Children	135	5,016	268	2,891	276	4,428	-	-	679	12,335
Physical Handicap	19	2,078	113	5,966	52	1,812	-	-	184	9,856
Alcohol/Drug	51	1,491	27	634	148	3,577	-	-	276	5,702
Transient	8	1,066	8	194	47	1,942	-	-	63	3,202
Delinquent	30	1,422	24	263	36	559	-	-	90	2,244
Unmarried Mother	3	116	2	53	25	486	-	-	30	655
Other	18	626	114	1,653	130	2,097	-	-	262	4,376
TOTAL	1,039	86,707	2,519	79,424	1,583	55,895	2	219	5,143	222,245

TABLE C.2

DISTRIBUTION OF SPECIAL CARE FACILITIES IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	72	12	12	9	2	-	-	-	-	107
PEI	36	6	5	4	-	-	-	-	-	51
NS	128	32	24	17	9	-	-	-	-	210
NB	185	36	24	13	3	1	-	-	-	262
QUE	293	188	206	82	25	8	-	-	-	802
ONT	1,162	258	226	161	59	24	3	2	-	1,895
MAN	238	51	37	14	10	1	-	1	-	352
SASK	100	73	35	18	1	1	2	-	-	230
ALTA	242	70	144	30	8	2	1	-	1	498
BC	459	118	79	44	7	4	-	1	-	712
YUKON	10	1	1	-	-	-	-	-	-	12
NWT	11	1	-	-	-	-	-	-	-	12
CANADA	2,936	846	793	392	124	41	6	4	1	5,143

TABLE C.3

DISTRIBUTION OF SPECIAL CARE FACILITY BEDS
IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	834	442	842	1,192	471	-	-	-	-	3,781
PEI	363	216	319	481	-	-	-	-	-	1,379
NS	1,406	1,152	1,737	2,075	2,107	-	-	-	-	8,477
NB	1,650	1,181	1,510	1,609	631	392	-	-	-	6,973
QUE	4,535	6,818	14,502	9,935	5,995	2,640	-	-	-	44,425
ONT	12,178	8,944	15,766	22,309	14,342	9,032	2,140	2,544	-	87,255
MAN	2,396	1,750	2,587	1,791	2,384	320	-	884	-	12,112
SASK	1,099	2,555	2,309	2,336	228	326	1,288	-	-	10,141
ALTA	2,128	2,702	8,886	3,867	1,924	645	520	-	2,100	22,772
BC	4,968	4,141	5,349	6,105	1,685	1,480	-	918	-	24,646
YUKON	112	35	51	-	-	-	-	-	-	198
NWT	120	26	-	-	-	-	-	-	-	146
CANADA	31,789	29,962	53,858	51,700	29,767	14,835	3,948	4,346	2,100	222,305

TABLE C.4

PERCENTAGE DISTRIBUTION OF SPECIAL CARE FACILITIES IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	1.400	0.233	0.233	0.175	0.039	-	-	-	-	2.081
PEI	0.700	0.117	0.097	0.078	-	-	-	-	-	0.992
NS	2.489	0.622	0.467	0.331	0.175	-	-	-	-	4.083
NB	3.597	0.700	0.467	0.253	0.058	0.019	-	-	-	5.094
QUE	5.697	3.655	4.005	1.594	0.486	0.156	-	-	-	15.594
ONT	22.594	5.017	4.394	3.130	1.147	0.467	0.058	0.039	-	36.846
MAN	4.628	0.992	0.719	0.272	0.194	0.019	-	0.019	-	6.844
SASK	1.944	1.419	0.681	0.350	0.019	0.019	0.039	-	-	4.472
ALTA	4.705	1.361	2.800	0.583	0.156	0.039	0.019	-	0.019	9.683
BC	8.925	2.294	1.536	0.856	0.136	0.078	-	0.019	-	13.844
YUKON	0.194	0.019	0.019	-	-	-	-	-	-	0.233
NWT	0.214	0.019	-	-	-	-	-	-	-	0.233
CANADA	57.087	16.450	15.419	7.622	2.411	0.797	0.117	0.078	0.019	100

TABLE C.5

PERCENTAGE DISTRIBUTION OF SPECIAL CARE FACILITY BEDS IN CANADA, BY PROVINCE AND SIZE CATEGORY

31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	0.375	0.199	0.379	0.536	0.212	-	-	-	-	1.701
PEI	0.163	0.097	0.144	0.216	-	-	-	-	-	0.620
NS	0.632	0.518	0.781	0.933	0.948	-	-	-	-	3.813
NB	0.742	0.531	0.679	0.724	0.284	0.176	-	-	-	3.137
QUE	2.040	3.067	6.523	4.469	2.697	1.188	-	-	-	19.984
ONT	5.478	4.023	7.092	10.035	6.452	4.063	0.963	1.144	-	39.250
MAN	1.078	0.787	1.164	0.806	1.072	0.144	-	0.398	-	5.448
SASK	0.494	1.149	1.039	1.051	0.103	0.147	0.579	-	-	4.562
ALTA	0.957	1.215	3.997	1.740	0.865	0.290	0.234	-	0.945	10.244
BC	2.235	1.863	2.406	2.746	0.758	0.666	-	0.413	-	11.087
YUKON	0.050	0.016	0.023	-	-	-	-	-	-	0.089
NWT	0.054	0.012	-	-	-	-	-	-	-	0.066
CANADA	14.300	13.478	24.227	23.256	13.390	6.673	1.776	1.955	0.945	100

EXPLANATORY NOTES

1. Data contained in Table C.1 is compiled from Statistics Canada Catalogue No. 83-201, "List of Canadian Hospitals and Special Care Facilities", 1981.

2. Data contained in Tables C.2 through C.5 is compiled from the above source, and from an unpublished Statistics Canada Custom Report, dated 24 February 1983, on Special Care Facility Bed Distribution as of 31 March 1981.

Survey of Energy Consumption in Canadian Hospitals

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TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - CANADA (Excl. PEI, NS, NWT, & Yukon)

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	368	4,416	65	1,042	81,563	180,934	78.3	174	25.8-967	2.22	0.48-4.54
25-49	229	8,008	84	3,025	207,166	555,828	68.5	184	33.2-783	2.68	1.00-5.67
50-99	207	14,139	99	6,476	548,547	1,475,535	84.7	228	41.0-1503	2.69	0.71-5.50
100-199	182	24,223	95	12,596	1,056,327	2,913,785	83.9	231	38.6-811	2.76	1.08-4.71
200-299	104	25,021	58	14,057	1,323,146	3,759,964	94.1	267	72.2-1544	2.84	0.48-5.62
300-499	110	42,592	60	23,354	2,112,420	6,275,040	90.5	269	55.4-953	2.97	1.78-5.24
500-799	61	37,237	30	17,271	1,708,248	5,063,103	98.9	293	91.8-566	2.96	1.46-5.14
800-1999	25	25,505	15	14,454	1,440,884	4,152,893	99.7	287	168-490	2.88	2.27-3.84
2000 +	2	5,019	2	4,811	364,383	457,616	75.7	95.1	77.4-112	1.26	1.22-1.28
TOTAL	1,288	186,160	508	97,086	8,842,684	24,834,698	91.1	256	25.8-1544	2.81	0.48-5.67

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - NFLD

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	23	323	2	38	1,989	5,201	52.3	137	92.4-177	2.61	1.82-3.29
25-49	10	344	2	84	3,143	5,276	37.4	63	33.7-99.7	1.68	1.23-1.99
50-99	4	247	3	177	14,648	51,550	82.8	291	48.2-813	3.52	1.51-4.43
100-199	4	562	4	626	39,230	128,844	62.7	206	38.6-610	3.28	1.21-4.33
200-299	3	783	1	233	14,304	40,336	61.4	173	-	2.82	-
300-499	4	1,576	1	340	62,195	255,000	183	750	-	4.10	-
500-799	-	-	-	-	-	-	-	-	-	-	-
800-1999	-	-	-	-	-	-	-	-	-	-	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	48	3,835	13	1,498	135,509	486,207	90.5	325	33.7-813	3.59	1.21-4.43

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - N.B.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	7	110	1	18	1,224	1,872	68.0	104	-	1.53	-
25-49	7	277	7	263	19,988	53,347	76.0	203	46.7-417	2.67	1.00-4.20
50-99	8	609	8	572	49,359	148,788	86.3	260	59.1-366	3.01	1.40-4.66
100-199	5	575	4	511	36,513	103,549	71.5	203	119-300	2.84	1.54-4.02
200-299	3	661	3	718	64,829	296,916	90.3	413	293-548	4.58	4.25-5.62
300-499	2	802	4	1,773	141,077	468,289	79.6	264	183-403	3.32	2.85-4.20
500-799	4	2,351	1	550	36,093	124,520	65.6	226	-	3.45	-
800-1999	-	-	-	-	-	-	-	-	-	-	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	36	5,385	28	4,405	349,083	1,197,281	79.2	272	46.7 -5 48	3.43	1.00-5.62

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - QUE.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	26	343	6	110	8,760	14,205	79.6	129	25.8-297	1.62	1.42-2.66
25-49	35	1,329	9	346	19,383	34,170	56.0	99	44.2-208	1.76	1.11-2.67
50-99	40	2,801	20	1,306	145,467	329,837	111	253	74.8-653	2.27	0.99-3.59
100-199	58	7,715	31	3,931	375,224	963,815	95.5	245	62.4-520	2.57	1.08-4.63
200-299	35	8,598	18	4,489	425,494	999,818	94.8	223	83.0-802	2.35	0.48-4.96
300-499	28	10,689	20	8,142	802,815	2,283,995	98.6	281	99.8-953	2.84	1.79-5.24
500-799	18	11,347	8	4,643	465,189	1,468,679	100	316	91.8-566	3.16	1.46-5.14
800-1999	6	5,666	4	3,774	305,092	921,766	80.8	244	168-294	3.02	2.48-3.51
2000 +	2	5,019	2	4,811	364,383	457,616	75.7	95.1	77.4-112	1.26	1.22-1.28
TOTAL	248	53,507	118	31,552	2,911,807	7,473,901	92.3	237	25.8-953	2.57	0.48-5.24

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - ONT.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	39	512	-	-	-	-	-	-	-	-	-
25-49	39	1,436	7	267	21,884	57,517	82.0	215	133-390	2.63	1.95-3.93
50-99	47	3,483	14	906	79,518	246,363	87.8	272	90.5-623	3.10	1.63-5.46
100-199	49	6,576	19	2,593	219,169	672,177	84.5	259	142-412	3.07	1.93-4.17
200-299	35	8,485	16	3,986	360,033	1,235,771	90.3	310	177-701	3.43	2.11-5.12
300-499	42	16,403	16	6,089	644,349	1,901,264	106	312	139-798	2.95	1.92-3.93
500-799	24	14,367	13	7,664	783,950	2,331,443	102	304	218-531	2.97	1.97-4.14
800-1999	9	8,349	6	5,596	611,430	1,761,114	109	315	205-490	2.88	2.35-3.84
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	284	59,611	91	27,101	2,720,333	8,205,649	100	303	90.5-798	3.02	1.63-5.46

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - MAN.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	64	755	18	287	23,688	51,992	82.5	181	46.5-754	2.19	1.00-4.20
25-49	18	574	11	401	22,901	50,164	57.1	125	33.2-298	2.19	1.42-3.59
50-99	8	539	16	1,025	55,763	107,206	54.4	105	42.6-212	1.92	0.71-2.53
100-199	6	699	8	995	69,960	202,797	70.3	204	80.0-391	2.90	1.60-3.88
200-299	1	252	1	284	12,137	20,512	42.7	72.2	-	1.69	-
300-499	8	3,179	5	1,854	135,901	404,301	73.3	218	83.2-332	2.97	1.84-3.65
500-799	-	-	1	522	35,492	88,731	68.0	170	-	2.50	-
800-1999	2	2,089	1	1,190	153,872	369,293	129	310	-	2.40	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	107	8,087	61	6,558	509,714	1,294,996	77.7	197	33.2-754	2.54	0.71-4.20

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - SASK.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	80	1,122	19	314	20,808	44,928	66.3	143	54.5-302	2.16	1.00-4.54
25-49	30	987	13	421	24,567	74,356	58.4	177	52.6-428	3.03	1.01-5.61
50-99	13	902	4	266	14,374	41,731	54.0	157	42.4-271	2.90	2.04-3.76
100-199	9	1,134	5	690	56,253	206,017	81.5	299	131-480	3.66	1.75-4.50
200-299	4	897	3	708	45,820	127,729	64.7	180	86.3-371	2.79	1.76-3.93
300-499	8	2,878	4	1,406	93,573	285,142	66.6	203	68.7-392	3.05	2.23-3.40
500-799	1	546	1	524	87,994	192,706	168	368	-	2.19	-
800-1999	-	-	-	-	-	-	-	-	-	-	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	145	8,466	49	4,329	343,389	972,609	79.3	225	42.4-480	2.83	1.00-5.61

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - ALTA.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	25	373	5	88	9,437	20,744	107	236	44.6-882	2.20	1.68-3.36
25-49	58	1,936	21	740	53,421	165,936	72.2	224	45.8-783	3.11	1.20-5.67
50-99	44	2,603	19	1,149	67,983	265,731	59.2	231	53.5-1051	3.91	1.95-5.50
100-199	13	1,694	7	921	105,664	241,186	115	262	70.0-811	2.28	1.87-4.30
200-299	5	1,073	6	1,246	70,926	212,029	56.9	170	98.8-276	2.99	1.95-3.59
300-499	5	1,969	4	1,322	91,766	244,904	69.4	185	134-233	2.67	2.10-3.82
500-799	7	4,489	2	1,107	88,087	289,319	79.6	261	258-265	3.28	3.05-3.54
800-1999	3	3,102	1	933	95,038	279,411	102	299	-	2.94	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	160	17,239	65	7,506	582,322	1,719,260	77.6	229	44.6-1051	2.95	1.20-5.67

TABLE D.1

SURVEY OF ENERGY CONSUMPTION IN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SURVEY RESULTS - B.C.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	41	395	14	187	15,657	41,992	83.7	225	81.6-967	2.68	0.48-3.36
25-49	23	811	14	503	41,879	115,062	83.3	229	47.2-356	2.75	1.67-3.77
50-99	23	1,648	15	1,075	121,435	284,329	113	264	41.0-1503	2.34	0.80-4.84
100-199	21	2,841	17	2,329	154,314	395,400	66.3	170	46.6-268	2.56	1.07-4.71
200-299	13	3,121	10	2,393	329,603	826,853	138	346	90.8-1544	2.51	2.03-3.67
300-499	9	3,536	6	2,428	140,744	432,145	58.0	178	55.4-244	3.07	1.78-3.59
500-799	7	4,137	4	2,261	211,443	567,705	93.5	251	200-369	2.68	2.36-2.96
800-1999	4	5,492	3	2,961	275,452	821,309	93.0	277	189-412	2.98	2.27-3.37
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	141	21,981	83	14,137	1,290,527	3,484,795	91.3	247	41.0-1544	2.70	0.48-4.84

VARIATION OF ENERGY INDICES WITH HOSPITAL SIZE CATEGORY

CANADA

SIZE CATEG. (BEDS)	NO. OF FACIL.	NO. OF BEDS	AV. BEDS PER FACIL.	AV. M^2/ BED	AV. G.J./ BED	AV. G.J./ M^2
1-24	65	1,042	16	78.3	174	2.22
25-79	84	3,025	36	68.5	184	2.68
50-99	99	6,476	65	84.7	228	2.69
100-199	95	12,596	133	83.9	231	2.76
200-299	58	14,057	242	94.1	267	2.84
300-499	60	23,354	389	90.5	269	2.97
500-799	30	17,271	576	98.9	293	2.96
800-1999	15	14,454	964	99.7	287	2.88
2000 +	2	4,811	2,406	75.7	95.1	1.26

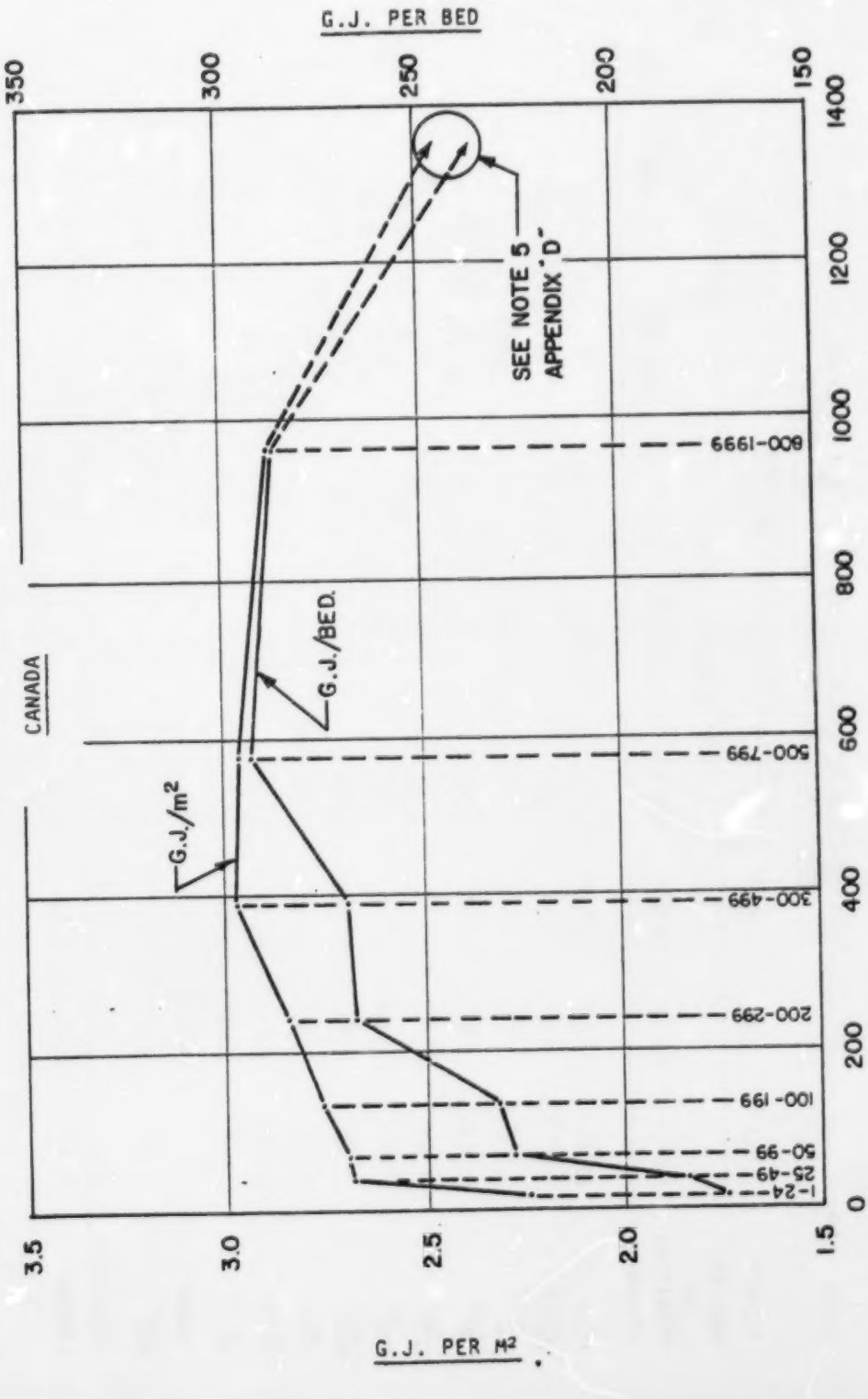

FIGURE D.1

VARIATION OF ENERGY INDICES
WITH HOSPITAL SIZE CATEGORY

TABLE D. 3

DISTRIBUTION OF ENERGY INDEX (G.J./M²) IN CANADIAN HOSPITALS, BY PROVINCE AND SIZE CATEGORY

1 APRIL 1980 TO 31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	(2.61)	(1.68)	3.52	3.28	(2.82)	(4.10)	-	-	-	3.59
PEI	-	-	-	-	-	-	-	-	-	-
NS	-	-	-	-	-	-	-	-	-	-
NB	(1.53)	2.67	3.01	2.84	4.58	(3.32)	(3.45)	-	-	3.43
QUE	(1.62)	(1.76)	2.27	2.57	2.35	2.84	3.16	3.02	1.26	2.57
ONT	-	(2.63)	3.10	3.07	3.43	2.95	2.97	2.88	-	3.02
MAN	2.19	2.19	(1.92)	2.90	1.69	2.97	2.50	(2.40)	-	2.54
SASK	2.16	3.03	2.90	3.66	2.79	3.05	2.19	-	-	2.83
ALTA	(2.20)	3.11	3.91	2.28	2.99	2.67	(3.28)	(2.94)	-	2.95
BC	2.68	2.75	2.34	2.56	2.51	3.07	2.68	2.98	-	2.70
YUKON	-	-	-	-	-	-	-	-	-	-
NWT	-	-	-	-	-	-	-	-	-	-
CANADA	2.22	2.68	2.69	2.76	2.84	2.97	2.96	2.88	1.26	2.81

Note: Numbers in parentheses may be questionable bacause of survey sample size limitation in that size category.

TABLE D. 4

DISTRIBUTION OF ENERGY INDEX (G.J./BED) IN CANADIAN HOSPITALS, BY PROVINCE AND SIZE CATEGORY

1 APRIL 1980 TO 31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	(137)	(63)	291	206	(173)	(750)	-	-		325
PEI	-	-	-	-	-	-	-	-	-	-
NS	-	-	-	-	-	-	-	-	-	-
NB	(104)	203	260	203	413	(264)	(226)	-	-	272
QUE	(129)	(99)	253	245	223	281	316	244	95	237
ONT	-	(215)	272	259	310	312	304	315	-	303
MAN	181	125	(105)	204	72	218	170	(310)	-	197
SASK	143	177	157	299	180	203	368	-	-	225
ALTA	(236)	224	231	262	170	185	(261)	(299)	-	229
BC	225	229	264	170	346	178	251	277	-	247
YUKON	-	-	-	-	-	-	-	-	-	-
NWT	-	-	-	-	-	-	-	-	-	-
CANADA	174	184	228	231	267	269	293	287	95	256

Note: Numbers in parentheses may be questionable because of survey sample size limitation in that size category.

TABLE D.5

CORRECTED DISTRIBUTION OF ENERGY INDEX (G.J./BED) IN CANADIAN HOSPITALS, BY PROVINCE AND SIZE CATEGORY

1 APRIL 1980 TO 31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	(174)	(184)	291	206	(267)	(269)	-	-	-	245
PEI	(174)	(184)	(228)	(231)	(267)	-	-	-	-	234
NS	(174)	(184)	(228)	(231)	(267)	(269)	-	(287)	-	248
NB	(174)	203	260	203	413	(269)	(293)	-	-	284
QUE	(174)	(184)	253	245	223	281	316	244	95	248
ONT	(174)	(184)	272	259	310	312	304	315	-	298
MAN	181	125	(228)	204	72	218	-	(287)	-	221
SASK	143	177	157	299	180	203	368	-	-	207
ALTA	(174)	224	231	262	170	185	(293)	(287)	-	249
BC	225	229	264	170	346	178	251	277	-	248
YUKON	(174)	-	-	(231)	-	-	-	-	-	216
NWT	(174)	(184)	(228)	-	-	-	-	-	-	199
CANADA	174	184	228	231	267	269	293	287	95	262

Note: Numbers in parentheses are based on average index for all Canada.

Task Force on Energy Management in Health Care Facilities

in co-operation with

Provincial Hospital/Health Associations

ENERGY USE SURVEY

Hospital/Facility Name: _____

City/Town; Province _____

Number of Beds: _____

Gross Heated Floor Area: _____ square metres (excludes crawl spaces, parking

(sq. ft. x 0.093 = sq. metres)

Energy Used, April 1, 1980 through March 31, 1981:

1.	Natural gas:	_____	cu. metres x 37.2	= _____	Megaj
	or	_____	ccf x 105.5	= _____	
	or	_____	mcf x 1055	= _____	
	or	_____	therms x 105.5	= _____	
2.	#2 Fuel Oil: (light)	_____	litres x 38.7	= _____	
	or	_____	gallons x 175.8	= _____	
3.	#6 Fuel Oil: (heavy)	_____	litres x 41.7	= _____	
	or	_____	gallons x 189.7	= _____	
4.	Propane:	_____	litres x 25.5	= _____	
	or	_____	kilograms x 50.2	= _____	
5.	Steam:	_____	kilograms x 2.25	= _____	
	or	_____	lbs x 1.02	= _____	
6.	Electricity:	_____	kWh x 3.6	= _____	
			TOTAL	_____	Megaj

$$\text{ENERGY INDEX} = \frac{\text{Megajoules}}{\text{}} = \text{_____} \text{ Megajoules/m}^2$$

EXPLANATORY NOTES

1. Survey was conducted in 1982 by the Task Force on Energy Management in Canadian Health Care Facilities (The "Task Force"), in cooperation with the Canadian Hospital Association.

2. Energy Consumption reported in the Survey covers the period 1 April 1980 to 31 March 1981.

3. Responses to the survey were received from 541 Hospitals. Of these responses, 508 were used in this study. No responses were received from Prince Edward Island, Nova Scotia, North West Territories, or the Yukon.

4. The following notes refer to information contained in Table D.1.

a) Average Energy Indices were calculated for each size category as follows:

i) G.J./Bed = $\frac{\text{Total Energy Consumption reported for size category}}{\text{Total number of beds reported for size category}}$

ii) G.J./M^2 = $\frac{\text{Total Energy Consumption reported for size category}}{\text{Total heated area reported for size category}}$

b) The tabulated ranges of the energy indices indicate the ranges, for each size category, of responses for individual Hospitals.

c) No attempt has been made to evaluate the validity or meaningfulness of the extreme values indicated in the various ranges of the energy indices.

5. With reference to Table D.2 and Figure D.1, a separate size category for Hospitals with 2000 + beds was established. There are only two such Hospitals in Canada; both responded to the survey. The energy indices calculated for these Hospitals are substantially lower than for the other size categories.

While the results for these two Hospitals may indicate a trend toward lower unit energy consumptions in very large facilities, this indication is questionable because of the low population in this size category. For this reason, the energy indices for this size category have not been included in Figure D.1.

6. The "Total" energy indices (for a province) shown in the extreme right hand columns of Tables D.3 and D.4 are not truly representative for the province because they are biased by the distribution of the responses to the survey. See Table D.5 and Note 7 for the corrected distribution of energy index by province and size category.

7. The "Total" energy indices (for a province) shown in the extreme right hand column of Table D.5 was calculated by dividing the total estimated energy consumption in the province, Ref. Table E.1, by the number of Hospital beds in the province.

Estimated Total Energy Consumption in Canadian Hospitals - 1 April 1980 to 31 March 1981

		PAGE
Table E.1	Estimated Total Energy Consumption in Canadian Hospitals - Individual Provinces	E-2
Table E.2	Estimated Total Energy Consumption in Canadian Hospitals - Canada - Method 1	E-14
Table E.3	Estimated Total Energy Consumption in Canadian Hospitals - Canada - Method 2	E-15
Table E.4	Estimated Total Energy Consumption in Canadian Hospitals - Canada - Method 3	E-16
Table E.5	Percentage Distribution of Estimated Total Energy Consumption in Canadian Hospitals, by Province and Size Category	E-17
	Explanatory Notes	E-18

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

NFLD

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	23	323	(174)	(56,202)
25-99	10	344	(184)	(63,296)
50-99	4	247	291	71,877
100-199	4	562	206	115,772
200-299	3	783	(267)	(209,061)
300-499	4	1,576	(269)	(423,944)
500-799	-	-	-	-
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	48	3,835	-	940,152

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

PEI

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	4	68	(174)	(11,832)
25-99	1	33	(184)	(6,072)
50-99	3	150	(228)	(34,200)
100-199	3	495	(231)	(114,345)
200-299	1	240	(267)	(64,080)
300-499	-	-	-	-
500-799	-	-	-	-
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	12	986	-	230,529

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

NS

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	13	207	(174)	(36,018)
25-99	6	222	(184)	(40,848)
50-99	14	980	(228)	(223,440)
100-199	13	1,812	(231)	(418,572)
200-299	4	911	(267)	(243,237)
300-499	4	1,560	(269)	(419,640)
500-799	-	-	-	-
800-1999	1	807	(287)	(231,609)
2000 +	-	-	-	-
TOTAL	55	6,499	-	1,613,364

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

NB

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	7	110	(174)	(19,140)
25-99	7	277	203	56,231
50-99	8	609	260	158,340
100-199	5	575	203	116,725
200-299	3	661	413	272,993
300-499	2	802	(269)	(215,738)
500-799	4	2,351	(293)	(688,843)
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	36	5,385	-	1,528,010

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

QUE.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	26	343	(174)	(59,682)
25-99	35	1,329	(184)	(244,536)
50-99	40	2,801	253	708,653
100-199	58	7,715	245	1,890,175
200-299	35	8,598	223	1,917,354
300-499	28	10,689	281	3,003,609
500-799	18	11,347	316	3,585,652
800-1999	6	5,666	244	1,382,504
2000 +	2	5,019	95.1	477,307
TOTAL	248	53,507	-	13,269,472

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

ONT.

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	39	512	(174)	(89,088)
25-99	39	1,436	(184)	(264,224)
50-99	47	3,483	272	947,376
100-199	49	6,576	259	1,703,184
200-299	35	8,485	310	2,630,350
300-499	42	16,403	312	5,117,736
500-799	24	14,367	304	4,367,568
800-1999	9	8,349	315	2,629,935
2000 +	-	-	-	-
TOTAL	284	59,611	-	17,749,461

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

MAN

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	64	755	181	136,655
25-99	18	574	125	71,750
50-99	8	539	(228)	(122,892)
100-199	6	699	204	142,596
200-299	1	252	72.2	18,144
300-499	8	3,179	218	693,022
500-799	-	-	-	-
800-1999	2	2,089	(287)	(599,543)
2000 +	-	-	-	-
TOTAL	107	8,087	-	1,784,602

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

SASK

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	80	1,122	143	160,446
25-99	30	987	177	174,699
50-99	13	902	157	141,614
100-199	9	1,134	299	339,066
200-299	4	897	180	161,460
300-499	8	2,878	203	584,234
500-799	1	546	368	192,832
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	145	8,466	-	1,754,351

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

ALTA

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	25	373	(174)	(64,902)
25-99	58	1,936	224	433,664
50-99	44	2,603	231	601,293
100-199	13	1,694	262	443,828
200-299	5	1,073	170	182,410
300-499	5	1,969	185	364,265
500-799	7	4,489	(293)	(1,315,277)
800-1999	3	3,102	(287)	(890,274)
2000 +	-	-	-	-
TOTAL	160	17,239	-	4,295,913

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

BC

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	41	395	225	88,875
25-99	23	811	229	185,719
50-99	23	1,648	264	435,072
100-199	21	2,841	170	482,970
200-299	13	3,121	346	1,079,866
300-499	9	3,536	178	629,408
500-799	7	4,137	251	1,038,387
800-1999	4	5,492	277	1,521,284
2000 +	-	-	-	-
TOTAL	141	21,981	-	5,461,581

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

YUKON

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	5	41	(174)	(7,134)
25-99	-	-	-	-
50-99	-	-	-	-
100-199	1	120	(231)	(27,720)
200-299	-	-	-	-
300-499	-	-	-	-
500-799	-	-	-	-
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	6	161	-	34,854

NOTE: Numbers in parentheses are based on average Energy Index for all Canada.

TABLE E.1

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

NWT

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	41	167	(174)	(29,058)
25-99	2	59	(184)	(10,856)
50-99	3	177	(228)	(40,356)
100-199	-	-	-	-
200-299	-	-	-	-
300-499	-	-	-	-
500-799	-	-	-	-
800-1999	-	-	-	-
2000 +	-	-	-	-
TOTAL	46	403	-	80,270

NOTE: Numbers in parentheses are based on average Energy Index for Canada.

TABLE E.2

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

CANADA

METHOD 1

PROVINCE OF TERRITORY	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	TOTAL ENERGY CONSUMPTION (G.J.)	% OF TOTAL
NFLD	48	3,835	940,152	1.9
PEI	12	986	230,529	0.5
NS	55	6,499	1,613,364	3.3
NB	36	5,385	1,528,010	3.1
QUE	248	53,507	13,269,472	27.2
ONT	284	59,611	17,749,461	36.4
MAN	107	8,087	1,784,602	3.7
SASK	145	8,466	1,754,351	3.6
ALTA	160	17,239	4,295,913	8.8
BC	141	21,981	5,461,581	11.2
YUKON	6	161	34,854	0.1
NWT	46	403	80,270	0.2
TOTAL	1,288	186,160	48,742,559	100

TABLE E.3

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

CANADA

METHOD 2

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Bed)	TOTAL ENERGY CONSUMPTION (G.J.)	% OF TOTAL
1-24	368	4,416	174	768,384	1.6
25-99	229	8,008	184	1,473,472	3.1
50-99	207	14,139	228	3,223,692	6.7
100-199	182	24,223	231	5,595,513	11.7
200-299	104	25,021	267	6,680,607	13.9
300-499	110	42,592	269	11,457,248	23.9
500-799	61	37,237	293	10,910,441	22.8
800-1999	25	25,505	287	7,319,935	15.3
2000 +	2	5,019	95.1	477,307	1.0
TOTAL	1,288	186,160	-	47,906,599	100

TABLE E.4

ESTIMATED TOTAL ENERGY CONSUMPTION
IN CANADIAN HOSPITALS

1 APRIL 1980 TO 31 MARCH 1981

CANADA

METHOD 3

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) Facil.	Beds	ENERGY INDEX (G.J./Facil.	TOTAL ENERGY CONSUMPTION (G.J.)	% OF TOTAL
1-24	368	4,416	2,784	1,024,365	2.2
25-99	229	8,008	6,617	1,515,293	3.2
50-99	207	14,139	14,904	3,085,210	6.5
100-199	182	24,223	30,671	5,582,199	11.8
200-299	104	25,021	64,827	6,742,004	14.3
300-499	110	42,592	104,584	11,504,240	24.4
500-799	61	37,237	168,770	10,294,976	21.8
800-1999	25	25,505	276,860	6,921,488	14.7
2000 +	2	5,019	228,808	457,616	1.0
TOTAL	1,288	186,160	-	47,127,391	100

TABLE E.5

PERCENTAGE DISTRIBUTION OF ESTIMATED TOTAL ENERGY CONSUMPTION IN CANADIAN HOSPITALS, BY PROVINCE AND SIZE CATEGORY

1 APRIL 1980 TO 31 MARCH 1981

PROVINCE OR TERRITORY	SIZE CATEGORY (BEDS)									TOTAL %
	1-24	25-49	50-99	100-199	200-299	300-499	500-799	800-1999	2000 +	
NFLD	0.115	0.130	0.147	0.238	0.429	0.870	-	-	-	1.929
PEI	0.024	0.012	0.070	0.235	0.131	-	-	-	-	0.473
NS	0.074	0.084	0.458	0.859	0.499	0.861	-	0.475	-	3.310
NB	0.039	0.115	0.325	0.239	0.560	0.443	1.413	-	-	3.135
QUE	0.122	0.502	1.454	3.878	3.933	6.162	7.356	2.836	0.979	27.224
ONT	0.183	0.542	1.944	3.494	5.396	10.500	8.960	5.396	-	36.415
MAN	0.280	0.147	0.252	0.293	0.037	1.422	-	1.230	-	3.661
SASK	0.329	0.358	0.291	0.696	0.331	1.199	0.396	-	-	3.599
ALTA	0.133	0.890	1.234	0.911	0.374	0.747	2.698	1.826	-	8.813
BC	0.182	0.381	0.893	0.991	2.215	1.291	2.130	3.121	-	11.205
YUKON	0.015	-	-	0.057	-	-	-	-	-	0.072
NWT	0.060	0.022	0.083	-	-	-	-	-	-	0.165
CANADA	1.556	3.183	7.151	11.891	13.905	23.495	22.953	14.884	0.979	100

1. The population of Hospitals and Hospital Beds shown in Tables E.1, E.2, E.3, and E.4 are based on Statistics Canada Catalogue No. 83-201, 1981, and on an unpublished Statistics Canada Custom Report on Hospital Bed Distribution as of 31 March 1981, dated 24 February 1983.

2. The Energy Indices (G.J./Bed) listed in Table E.1 are those obtained in the Task Force Survey, Ref. Table D.1.

3. The total estimated Energy Consumption in Canadian Hospitals calculated by Method 1, Ref. Table E.2, is the sum total of the individual Provincial Energy Consumptions tabulated in Table E.1.

4. The total estimated Energy Consumption in Canadian Hospitals calculated by Method 2, Ref. Table E.3 is based on the average Canada Energy Index, for each size category, obtained from Table D.1.

5. The total estimated Energy Consumption in Canadian Hospitals calculated by Method 3, Ref. Table E.4, is based on the average Energy Consumption per facility, for the various size categories. This parameter (or energy index) was calculated by dividing the total Canada Energy Consumption, per Task Force Survey, for a given size category, by the number of Hospitals responding in that size category (Ref. Table D.1).

6. The percentages tabulated in Table E.5 are based on the total estimated Energy Consumptions per Tables E.1 and E.2.

Energy Consumption and Related Data for Ontario Hospitals compiled by the Ontario Ministry of Health. *

		PAGE
Table F.1	Example of OMH Date compiled for One Hospital.	F-2
Table F.2	Summary of Data for all Reporting Hospitals in Ontario.	F-4
Table F.3	Estimated Total Energy Consumption for Ontario Hospitals based on Energy Indices from Table F.2.	F-5
	Explanatory Notes	F-6

* Ontario Ministry of Health, Institutional Planning Branch, courtesy E.J. Parker, P. Eng.

TABLE F.1

EXAMPLE OF OMH DATA COMPILED FOR ONE HOSPITAL

REPORT:11 — ENERGY CONSUMPTION SYSTEM — REP DATE:82/03/02

P133 — STUDY AND HISTORY INFORMATION REPORT — PAGE: 1

HOSPITAL NO: — EFF DATE: 76/12 — STATUS: Y - COMPLETED

CONSTRUCTION:

			CURRENT FLOOR AREA (SQ.FT)
YEAR	1967	1975	
FLOOR (SQ.FT)	225,999	292,696	
BED CAPACITY	0	0	
WALLS	R5 - R10	R5 - R10	
ROOF	R5 - R10	R5 - R10	
GLASS	DOUBLE GLAZING	DOUBLE GLAZING	292,696

STEAM : ON SITE STEAM PRODUCTION
LAUNDRY : (EXTERNAL) LAUNDRY SERVICE
H.V.A.C.: TERMINAL REHEAT
OTHER
FUELS : ELECTRICITY
#2 OIL
NATURAL GAS
STANDBY OIL

CONSULTANT: 11 — STUDY COMPLETED: 77/02

AVG PRE-STUDY CONSUMPTION FOR 1976 THRU 1977

ELECTRICITY =	27.6	KWH/SQ.FT/YR
OTHER FUELS =	70.5	EQ.KWH/SQ.FT/YR
T O T A L =	98.1	EQ.KWH/SQ.FT/YR

RECOMMENDATIONS:
FAN SPEED REDUCTIONS DURING UNOCCUPIED PERIODS (NIGHTS/WKENDS)
REDUCE OPERATING HOURS OF CERTAIN AREAS OR SYSTEMS
RE-BALANCE EXISTING AIR-HANDLING SYSTEM(S)
REPAIR CRACKS, INSTALL WEATHER STRIPPING ETC.
RESET TEMP. & HUMIDITY CONTROLS TO LIMITS OF COMFORT ZONE
LIGHTING REDUCTIONS DURING UNOCCUPIED PERIODS (NIGHTS/WKENDS)
MAKE USE OF DAYLIGHTING
REDUCE LIGHTING LEVELS BY REMOVING CERTAIN FIXTURES
INCREASE USE OF 'TASK' (OR SUPPLEMENTAL) LIGHTING
MAINTAIN REGULAR CLEANING & MAINT. PROG. FOR LIGHTING AND EQUIP.
IMPROVE WALL INSULATION
IMPROVE ROOF INSULATION
REDUCE AIR VOLUMES
CHILLER OR CONDENSER MODIFICATIONS OR CONTROL ADJUSTMENTS
INSTALL PEAK (ELEC.) DEMAND LIMITING DEVICES
INSTALL RUN-AROUND GLYCOL HEAT RECOVERY SYSTEM(S)
CONSIDER SOLAR-HEATING OF DOMESTIC HOT WATER
INSTALL/ADJUST AUTOMATIC CONTROLS ON ELEC. PANELS/AC UNITS
IMPROVE SOLAR SCREENING ON SOUTHERLY EXPOSURES

COMMENTS:

TABLE F.1 (Cont'd)

EXAMPLE OF OMH DATA COMPILED FOR ONE HOSPITAL

REPORT:11 — ENERGY CONSUMPTION SYSTEM — REP DATE:82/03/02

P134 — STUDY AND HISTORY INFORMATION REPORT — PAGE: 2

HOSPITAL NUMBER	REP DATE	BEDS STAFFED	ELECTRICITY (K.W.H.)	GAS (MCH)	STEAM (MKG)	OIL (LITRES)	PROPANE (LITRES)	FLOOR AREA (SQ.FT)	---EQ.KWH/SQ.FT/ANNUM-- ELECTRIC	OTHERS	TOTAL
	78/06	300	1,736,056	472	0	3,682	0	215,116	.0	.0	.0
	78/09	300	3,751,041	848	0	6,000	0	215,116	.0	.0	.0
	78/12	300	5,429,277	1,313	0	11,214	0	215,116	.0	.0	.0
	79/03	300	7,159,446	1,830	0	53,037	0	215,116	33.2	65.4	98.7
	79/06	300	2,086,643	365	0	1,682	0	215,116	.0	.0	.0
	79/09	300	4,076,486	773	0	1,818	0	215,116	.0	.0	.0
	79/12	300	5,611,223	1,276	0	1,863	0	215,116	.0	.0	.0
	80/03	300	7,230,221	1,904	0	40,777	0	215,116	33.6	65.5	99.1
	80/06	300	1,628,607	369	0	1,957	0	208,400	.0	.0	.0
	80/09	300	3,676,416	719	0	8,990	0	208,400	.0	.0	.0
	80/12	300	5,165,440	1,216	0	40,904	0	208,400	.0	.0	.0
	81/03	300	6,674,413	1,776	0	61,743	0	208,400	32.0	63.9	95.9
	81/09	303	3,526,962	683	0	20,893	0	208,400	.0	.0	.0
	81/12	303	5,111,692	1,075	0	250	0	208,400	.0	.0	.0

TABLE F.2

SUMMARY OF DATA FOR ALL REPORTING HOSPITALS IN ONTARIO

1 APRIL 1980 TO 31 MARCH 1981

SIZE CATEG. (BEDS)	TOTAL POLULATION (STAT.CAN.) FACIL.	BEDS	SUMMARY OF REPORTED DATA NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	39	512	9	179	21,807	42,451	122	237	45.2-762	1.95	0.45-2.89
25-49	39	1,436	31	1,107	108,511	250,294	98.0	226	95.6-475	2.31	1.35-4.99
50-99	47	3,483	45	3,175	325,726	991,699	102	312	90.8-1010	3.04	1.05-5.64
100-199	49	6,576	33	4,909	435,980	1,309,621	88.8	267	55.0-921	3.00	1.22-9.20
200-299	35	8,485	25	6,044	521,207	1,485,403	86.2	246	98.6-476	2.85	1.72-4.45
300-499	42	16,403	20	7,031	755,488	1,719,109	107	245	42.8-702	2.28	1.19-3.91
500-799	24	14,367	15	8,570	736,996	1,961,787	86.0	229	65.4-509	2.66	0.92-3.96
800-1999	9	8,349	4	3,621	459,960	1,393,183	127	385	250-568	3.03	2.07-5.69
2000+	-	-	-	-	-	-	-	-	-	-	-
TOTAL	284	59,611	182	34,636	3,365,675	9,153,547	97.2	264	42.8-1010	2.72	0.45-9.20

TABLE F.3

ESTIMATED TOTAL ENERGY CONSUMPTION FOR ONTARIO HOSPITALS BASED ON ENERGY INDICES FROM TABLE F.2

1 APRIL 1980 TO 31 MARCH 1981

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	ENERGY INDEX (G.J./BED)	TOTAL ENERGY CONSUMPTION (G.J.)
1-24	39	512	237	121,344
25-49	39	1,436	226	324,536
50-99	47	3,483	312	1,086,696
100-199	49	6,576	267	1,755,792
200-299	35	8,485	246	2,087,310
300-499	42	16,403	245	4,018,735
500-799	24	14,367	229	3,290,043
800-1999	9	8,349	385	3,214,365
TOTAL	284	59,611		15,898,821

EXPLANATORY NOTES

1. The following formula has been used for calculation of EQ.KWH/SQ.FT/ANNUM in history reports (e.g. Table F.1).

E.Q.KWH/SQ.FT/ANNUM =
(B + (C*C1*0.7 + D*10**6*0.7 + F*10**6 + G*G1*0.7)/
3412) / A.

Where A = Gross Floor Area in Sq.Ft.
B = KWH Electricity (12 months total)
C = Imperial Gal.Oil (12 months total)
C1 = Heating value of oil (average 165,000 BTU/Imp.Gal)
D = 1000 cubic feet (MCF) of natural gas (12 months total)
F = 1000 lbs (M Lbs) of steam (12 months total)
G = Imperial Gal. propane (12 months total)
G1 = Heating value of propane (100,000 BTU/Imp.Gal)
3412 = Conversion of B.TU into KWH (constant value)

2. Data covers only those hospitals under the jurisdiction of the Ontario Ministry of Health (Public Hospitals). Federal, Proprietary, and Psychiatric Hospitals are not included.

3. A total of 224 Hospitals are listed in the Data. Energy consumption is not reported for every Hospital.

4. Data tabulated in Tables F.2 and F.3 is based on information from 182 Hospitals.

5. The number of beds reported in the Data is "staffed beds", which has a similar meaning as "approved beds" used by Statistics Canada.

6. Factors used in converting Data from Imperial Units (e.g. Table F.1) to S.I. Units (e.g. Table F.2) are:

a) $M^2 = ft^2 \times 0.093$
b) $G.J. = eKWH \times 3.6 \times 10^{-3}$
c) $G.J./M^2 = eKWH/ft^2 \times \frac{1}{25.83}$

Energy Consumption and related Data for New Brunswick Hospitals compiled by the New Brunswick Department of Health *

		PAGE
Table G.1	Summary of Data for all Hospitals in New Brunswick	G-2
	Explanatory Notes	G-3

* Courtesy G.B. Seely

TABLE G.1

SUMMARY OF DATA FOR ALL HOSPITALS IN NEW BRUNSWICK

1 APRIL 1980 TO 31 MARCH 1981

SIZE CATEG. (BEDS)	TOTAL POPULATION (STAT.CAN.) FACIL.	BEDS	SUMMARY OF REPORTED DATA NO. OF FACIL.	NO. OF BEDS	AREA (M^2)	ENERGY CONSUMED (G.J.)	M^2/ BED	ENERGY INDICES G.J./BED AV.	RANGE	G.J./M^2 AV.	RANGE
1-24	7	110	5	82	6,457	12,125	78.7	148	87.4-193	1.88	1.49-2.60
25-49	7	277	7	261	19,178	60,763	73.5	233	86.3-418	3.17	1.71-3.81
50-99	8	609	8	575	49,968	161,270	86.9	280	130-366	3.23	1.36-4.91
100-199	5	575	7	854	63,462	213,033	74.3	249	171-301	3.36	2.55-4.34
200-299	3	661	4	974	109,435	370,010	112	380	124-529	3.38	1.36-4.21
300-499	2	802	-	-	-	-	-	-	-	-	-
500-799	4	2,351	5	2,828	219,607	566,826	77.7	200	129-257	2.58	2.13-3.31
800-1999	-	-	-	-	-	-	-	-	-	-	-
2000 +	-	-	-	-	-	-	-	-	-	-	-
TOTAL	36	5,385	36	5,574	468,107	1,384,027	84.0	248	86.3-529	2.96	1.36-4.91

EXPLANATORY NOTES

1. The annual statistics compiled by the province of New Brunswick, for each Hospital, include:

a) Name of Hospital
b) Number of beds
c) Fuel consumption (oil, coal, wood, purchased steam)
d) Fuel cost
e) Electrical consumption
f) Electricity cost
g) Gross floor area
h) Energy index - eKWH/ft^2/yr.

2. The summary Data given in Table G.1 covers all Hospitals in New Brunswick for the period 1 April 1980 to 31 March 1981. While Statistics Canada Records indicate that there are two Hospitals in the 300-499 bed category, New Brunswick Data indicate no Hospitals in this size category. This difference is essentially explained by minor disparities in bed count. The total number of facilities and beds reported by both Statistics Canada and New Brunswick are essentially identical.

3. Factors used in converting Data from Imperial to S.I. Units are:

a) $M^2 = ft^2 \times 0.093$
b) G.J. = eKWH $\times$ 3.6 $\times$ 10^{-3}
c) $G.J./M^2 = eKWH/ft^2 \times \frac{1}{25.83}$

POOR

QUALITY

ORIGINAL